ATSR Workshop Report

13 Apr 2000 - 12:02:57

Dual-view Operational Atmospheric Correction for ATSR-2 Imagery

Abstract Number: 1

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Theme:	Data Processing (atmospheric correction) and Merging (e.g. with AVHRR data)

Absract:	Accurate satellite observations at a global scale are required to improve understanding of the earths radiation budget, atmospheric aerosol transport and vegetation / climate interactions. However all such observations are a mixture of contributions from the atmosphere and surface.Here we describe a technique to exploit the differential atmospheric paths sampled by ATSR-2 imagery to separate the contributions from atmospheric aerosol and land surface scattering, for the solar reflective channels. The result is an image of the land surface reflectance, relatively uncontaminated by atmospheric scattering, and a separate image of the atmospheric aerosol loading. A general model of land surface bidirectional reflectance is developed and used as a constraint to simultaneously retrieve atmospheric aerosol opacity and bidirectional reflectance from top of atmosphere radiance. The inversion assumes no a priori knowledge of the land surface cover. The technique is demonstrated on a study of smoke aerosol over boreal forest in Canada, observed during May to September 1995. Comparison of the satellite aerosol optical thickness estimates with those derived from a ground network of solar occultation photometers show agreement to within 0.02 at 555nm, over the period. The time series of images shows greatly improved stability of the observed land surface reflectance.

Skin sea surface temperature retrievals - the asymptoticapproach to perfection?!

Abstract Number: 2

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Theme:	Data Processing (atmospheric correction) and Merging (e.g. with AVHRR data)
Absract:	Co-authors: A R Harris (UKMO) and M J Murray (RAL)To use ATSR for climate change purposes or investigation of subtle effects such as skin-bulk differences we need SST retrievals that are essentially free from artefactual trends and biases. We present a comprehensive reworkingof ATSR dual-view retrieval that has substantiallyremoved the following defects in the prelaunch scheme:post-Pinatubo volcanic aerosol bias and trend; water vapourrelated biases; systematic across-track biases; and bias from changing detector temperatures. Developments in theradiative transfer modelling used for coefficient derivationinclude updated treatment of water vapour absorption, surface emissivity and aerosol scattering parameterisation.We have also demonstrated that a serious degradation in retrieval quality occurs if inappropriate assumptions aboutinstrumental noise are made. Validation suggests bias of<0.1 K in tropical regions and standard deviation of 0.25 K from dual-view retrievals using the 11 & 12 micron channels,even under the heavy Pinatubo aerosol loadingsearly in the ATSR mission. We point to a strategy for long-term bias minimisation for climate change research. Climate change research and geophysical results on diurnal and skin effects obtained using the new coefficient scheme will be presented in other sessions by the co-authors.

The use of ATSR-2 for tropical forest mapping within the Joint Research Centre's TREES project

Abstract Number: 3

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Theme:	Vegetation, Forestry, Landuse
Absract:	Frederic AchardPhilippe MayauxJurgen StibigThe ATSR-2 is being used to update regional scale maps of the humid forest extent in Africa, Asia and Latin America. The data are being used to locate areas of rapid change and to map certain types of forests such as mangroves and swamp forest. At the same time exceptional events such as fires and burnt areas are being monitored. The work is carried out in the framework of the Joint Research Centre's TREES project.

Exploiting the synergy of GOME and ATSR-2 for the retrievalof aerosol properties over land and ocean

Abstract Number: 4

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Theme:	Atmospheric Applications and Meteorology, Cloud detection
Absract:	Thomas HOLZER-POPP, Marion SCHROEDTER, and Gerhard GESELLDeutsches Zentrum fue?r Luft- und Raumfahrt e.V. (DLR)Deutsches Fernerkundungsdatenzentrum (DFD)Oberpfaffenhofen, D-82234 Wessling, Germanyphone: ++49-8153-28-1382, fax ++49-8153-28-1445e-mail: Thomas.Holzer-Popp@dlr.deCurrently operational satellite observation of aerosols is limited toeither the oceans or to UV-absorbing aerosols. A 1km pixel size isrequired in order to automatically select dark pixels which are bestsuited to derive aerosol optical thickness. For the identification ofdifferent aerosol types measurements from the UV upto the MIR areneeded. Finally, for the retrieval of aerosol vertical distribution ahigh spectral resolution is required. The combination of GOME and ATSR-2is currently the only system in space which fulfills these requirements.A new synergetic aerosol retrieval method SYNAER (Synergetic AerosolRetrieval) is presented together with ground-based and airbornevalidation results. The method was developed within the ESA AO-2 projectPAGODA (Project for ATSR and GOME Data Application). It delivers aerosoloptical thickness and the type of boundary layer aerosol over land andocean. Especially the high spatial resolution of ATSR-2 is used forcloud detection, calculation of aerosol optical thickness using darkpixels, and derivation of surface albedo.

Optimal estimation of cloud parameters from visible and infrared ATSR-2/AATSR measurements

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Theme:	Atmospheric Applications and Meteorology, Cloud detection
Absract:	The technique of optimal estimation (OE) is applied to the retrieval of cloud parameters from the complete set of visible and infrared measurements of ATSR-2. The method estimates cloud fraction, optical depth, particle effective diameter (and phase) and cloud-top pressure and is based on look-up tables (calculated from a full multiple scattering solar and infrared model) embedded in an absorbing atmosphere. We demonstrate the potential of the methodology to utitlise measurements and auxilliary information, to properly account for errors in both and to provide two complementary quality control mechanisms. Results from a variety of scene types are presented to illustrate these features and to explore the methods potential to verify basic particle scattering/absorption models. Co-authors: Anthony J Baran, UKMO, Bracknell, Berks, UK. Sarah K Watts, Oxford University, UK. Ping Yang, University of California, USA.

Use of the ATSR series in the construction of a long-term SST record for climate change detection

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)

Absract:	The Hadley Centre is the prime end-user for data from theAATSR instrument due to be launched in the year 2000. TheUK Department of the Environment, Transport and the Regionsis the main funding agent for both the instrument and theHadley Centre Climate Prediction Programme. This presentation gives an overview of the processes we areemploying to ensure that the data collected by the ATSRseries of instruments are optimal for the purpose of climatechange detection. Issues include the removal of biases andnon-geophysical secular trends, the requirement for bulktemperatures and the effects of different instrumentcharacteristics. We will present output from both skineffect and diurnal thermocline models driven by analysisfluxes of heat and momentum, together with verification using hundreds of matchups with in situ data. Areas ofcurrent and requirements for future research will also bediscussed.Co-authorsBrett Candy, UK Meteorological OfficeChris Merchant, Department of Meteorology, U. Edinburgh

Validation of ATSR-2 land surface reflectance data

Abstract Number: 7

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Theme:	Data Processing (atmospheric correction) and Merging (e.g. with AVHRR data)
Absract:	M.D. Steven, G. Rondeaux, F. Prata, G. Mackay and J.A. ClarkTo test and validate atmospheric and surface algorithms in the reflected solar bands, field measurements were made simultaneous with ATSR-2 data acquisitions in representative sites and seasons. Campaigns were conducted on La Crau (France), Uardry and Amburla (Australia), with dates chosen to give a range of phase angles, including values near the hot spot. Field data included full BRDF measurements of surface, solar direct and diffuse irradiance, and optical depth. The Mackay atmospheric retrieval model defines a shape factor R as the ratio of forward to nadir reflectance and predicts that R is semi - independent of wavelength. The retrieval procedure adjusts the parameters of the 5S atmospheric model until R matches at two selected wavelengths. The field data indicate generally high precision of the 5S model and Mackay's inversion scheme. Measured shape factors at the ground matched well except at Amburla. Mackay's retrieval gave reflectance values within 3% on La Crau, but did not converge at the small phase angles encountered in Australia. Direct application of the 5S model with measured optical depth also gave retrieved values within 3% of measurements. The models require some improvement to deal with small phase angles, red soils and atypical aerosols, but the database is not model-specific and can be used to test other retrieval procedures.

Improved Cloud Detection and Cross-Calibration of ATSR, MODIS and MERIS Data

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	Unsupervised classification methods, when combined with robust information vectors and feed forward neural networks for labelling, provide a basis for very accurate cloud detection in satellite data. Preliminary results, obtained by applying these methods to satellite data, show the usefulness of these methods for cloud detection. Anticipated directions for our ERS-II, ENVISAT and EOS-AM investigations, which will utilize a combination of data from the family of ATSR instruments, MERIS and MODIS, will emphasize a suite of complementary atmospheric, terrestrial and oceanic applications.

Ongoing validation of ATSR-2 SST products

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	Between August 1996 and July 1998 five ATSR-2 validation campaigns were undertaken in the oceans adjacent to Australia. The varied results from these campaigns are presented and the results indicate that the instrument is providing accurate SST values over a wide range of climatic conditions. The results also indicate that much care will be required for reliable validation of the SST estimates to be derived from AATSR data.

Cloud cover fraction and cloud top pressure retrieval from GOME compared with ATSR-2 and ISCCP.

Abstract Number: 11

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Theme:	Atmospheric Applications and Meteorology, Cloud detection
Absract:	author: Robert Koelemeijerco-author: Piet StammesCloud cover fraction and cloud top pressure are the most important cloud parameters needed for accurate ozone column retrievals from the Global Ozone Monitoring Experiment (GOME). Presently, cloud top pressure is assumed a-priori in the ozone column retrieval. Here we report on an improved cloud scheme which we developed for ozone column retrieval, which simultaneously retrieves cloud fraction and cloud top pressure. This algorithm (FRESCO) makes use of radiances measured in three narrow wavelength intervals in and outside the oxygen A-band, namely at 758 nm (no absorption), 761 nm (strong absorption), and 765 nm (moderate absorption). Cloud fraction and cloud top pressure are derived using the Levenberg-Marquardt method. The results are compared to cloud fractions and cloud top pressures derived from colocated ATSR-2 measurements. To this end, a cloud detection algorithm is used to separate clear and cloudy pixels in ATSR-2 images. The brightness temperatures of the cloudy pixels as measured by ATSR-2 are related to cloud top pressures using ECMWF profiles. Also, global monthly average FRESCO results of cloud top pressure and cloud fraction are compared to those from the ISCCP/D2 climatology. Generally, the results agree well; typical errors in the retrieved cloud fraction are smaller than 0.1, cloud pressure errors are within 100 hPa.GOME is the first instrument which measures the oxygen A-band on a global scale. The results may not only be useful for ozone column retrieval, but may also be useful to provide cloud parameters globally, on the spatial scale of GCMs.

THE RETRIEVAL OF CIRRUS CLOUD MICROPHYSICAL AND BULK PROPERTIES FROM ATSR-2

Abstract Number: 13

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Theme:	Poster
Absract:	Sarah K. Watts, AOPP, Oxford University, Parks Road, Oxford, UK,Email:swatts@atm.ox.ac.ukAnthony J. Baran, UK Meteorological Office, Bracknell, UK, Email:ajbaran@meto.gov.ukPhilip D. Watts, Rutherford Appleton Laboratory, Chilton, UK, Email:p.d.watts@rl.ac.ukMark J. Webb, UK Meteorological Office, Bracknell, UK, Email:mjwebb@meto.gov.ukPing Yang, Department of Atmospheric Sciences, UCLA, CA, USA, Email:yang@atmos.ucla.eduATSR-2 has multispectral and dual-look capabilities for retrieving cloud parameters including optical depth, crystalsize, and making crystal habit ice water path estimates. Cloud is modelled as a single, homogeneous layer, specified by the single scattering albedo, optical depth and the scattering phase function, assuming a crystal shape. We present retrievals based on the Finite Difference Time Domain (FDTD) method. Crystal optical properties and single scattering phase functions are calculated for a variety ofcrystal shapes at 0.55, 0.87, 1.6 and 3.7 micron wavelengths.Tropical and mid-latitude cirrus cases are presented to estimate the dominant crystal habit, thereby testing the FDTD predictions of the scattering phase functions representing the various crystal habits. Retrievals of the optical depth and De, and the estimation of IWP, will also be made together with comparisons with UK MeteorologicalOffice HadAM4 model predictions for selected case studies.

Improved monitoring of oceanographic features in the Gulf of Oman through combined use of satellite thermal infrared, ocean colour and radar altimeter observations.

Abstract Number: 14

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)

Absract:	Traditionally, satellite thermal infrared sensors have provided the oceanographer with a unique source of synoptic information about the ocean and coastal environments. ATSR data have been used to detect and monitor ocean features including fronts and eddies. The data contain fine-scale structure revealing circulation patterns in eddies due to the sensitivity of the ATSR instrument. This study has compared ATSR-2 thermal infrared measurements in the Gulf of Oman with near-coincident ocean colour observations from ORBVIEW-2 SeaWiFS, and TOPEX/Poseidon and ERS radar altimeter data. Observations from these complementary instruments can be combined to provide a more robust means of detecting and tracking oceanic and coastal features. The study has important implications for the subsequent synergistic use of AATSR and MERIS sensors on board the future ENVISAT platform.Co-authors: W. Aicken, S. Shimwell & N. Stapleton

The ENVISAT AATSR Processing Algorithms and Data Products

Abstract Number: 15

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Theme:	ENVISAT AATSR (mission, instrument, project plans)
Absract:	The Advanced Along-Track Scanning Radiometer (AATSR) is the successor to ATSR-2 and will fly aboard ENVISAT-1 to provide continuing accurate and precise global measurements of sea surface temperature. This paper presents an overview of the AATSR system, with particular reference to the AATSR ground processor architecture, processing algorithms and data products. The AATSR processor makes full use of the ATSR series heritage, but the data products have been redeveloped. The new products are introduced and differences from the ATSR-2 products outlined.

The impact of 12 micron detector temperature on ATSR-1 data processing

Abstract Number: 16

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Theme:	Poster
Absract:	Measurements of typical detectors used in the 12 micron channel of ATSR-1 show that their frequency response displays small but significant dependence on their operating temperature. The actual in-flight configuration was operated, for the majority of the mission, at a higher temperature than that at which it was calibrated, and this may have a small but significant impact on retrieved sea surface temperature (SST). This paper discusses this effect quantitatively, outlines the current state of development of revised algorithms for SST retrieval taking account of this effect, and gives guidelines for future re-processing.

Cloud detection over land surfaces in ATSR-2 images

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Theme:	Atmospheric Applications and Meteorology, Cloud detection
Absract:	AUTHORS: Richard Smith*, Dr Stephen Hobbs*KEYWORDS: Fuzzy Classification, Cloud Detection, ATSRABSTRACT TEXT:There are many applications for low-resolution (~1km) satellite data. Climate, land, and cloud studies all include examples of commercial and scientific uses of such data. For the effective application of processing techniques used to derive information from satellite data, it is necessary to determine if the image data contains atmospheric artifacts. Algorithms used to derive products from satellite data require a pixel to contain either entirely cloud or entirely surface information only. The objective of this research project is to produce a cloud screening system for ATSR-2 images with a reliability of 90 - 95%.This paper presents a pilot processing scheme that has been developed using ATSR-2 image data. The cloud detection is performed using a synergy of familiar methods, algorithms, knowledge-based systems and fuzzy set theory, and is controlled using fuzzy logic operators. This novel approach utilises all of the attributes of the ATSR-2 instrument, i.e. the visible and thermal channels, and the dual look capability. The performance of the scheme is evaluated using simulated data sets containing pixels of known classes, to which the processed image is compared.Future work will include the expansion of the processing algorithm set, expansion of the knowledge-base and further development work to produce a fully operational, unsupervised cloud detection system.

Using ATSR-2 data to understand the temporal and spatial dynamics of vegetation in the arid region of Jordan

Abstract Number: 18

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Theme:	Vegetation, Forestry, Landuse
Absract:	Marianne Edwards, Jane Wellens and Andrew MillingtonDepartment of Geography, University of Leicester, Leicester, LE1 7RHVegetation cover in arid regions is typically sparse, showing large spatial and temporal variability due to factors such as the availability of water and the quality and type of soil. This paper describes how these variations can be detected and monitored using ATSR-2 imagery. Using data collected over a two year period for the semi-arid Badia region of Jordan, a geometric optical/empirically based model was used to detect changes in vegetation cover. Results showed that the use of a model considering processes at the sub-pixel scale allows one to model changes in reflectance with changing percentage vegetation cover, and thus predict cover from ATSR-2 imagery. Correlations of 0.837 were found between predicted percentage vegetation covers and actual observations made at 16 field sites in the study area. The paper also considers the wider implications of the spatial, temporal and spectral resolutions of ATSR-2 for vegetation mapping in arid regions. Whilst the spatial and temporal resolution are favourable for detecting vegetation change over large areas, the narrow wavebands offer no advantage for locating vegetation characteristic of arid climates as compared to the broader wavebands of other sensors such as AVHRR.

Calibration of the ATSR-2 Visible/Near Infra-Red Channels

Abstract Number: 19

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Theme:	Data Processing (atmospheric correction) and Merging (e.g. with AVHRR data)
Absract:	The ATSR-2 visible/near-infrared channels at 0.56um, 0.66um, 0.87um and 1.6um are calibrated by an in-flight VISCAL system. This has proved to be essential to correct for short-term and long-term variations in the signal channel gains. A summary of the calibration campaigns and satellite comparisons are presented. A number of desert sites have been assessed for their usefulness in long-term trend monitoring and absolute calibration. Using clear sky reflectances has been possible to obtain calibration drifts of ~1.5% per year for the 0.56um, 0.66um and 0.87um channels and ~0.4% per year at 1.6um. The analysis showed that sites located in the Sahara and Saudi deserts were most suitable. Other sites were more susceptible to seasonal variations. In particular, the Sechura Desert in Peru became flooded as a result of the 1997 El-Nino. Data from the Greenland ice cap have also been analysed to produce similar drift rates.

ATSR-2 derived cirrus crystal size and optical thickness for different hexagonal crystal shapes.

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Theme:	Atmospheric Applications and Meteorology, Cloud detection
Absract:	Wouter H. Knap, Piet Stammes, Robert B. A. KoelemeijerRoyal Netherlands Meteorological Institute (KNMI),De Bilt, The NetherlandsABSTRACTThe retrieval of cirrus optical thickness and crystal size from satellite measurements is dependent on the assumed particle shape in single-scattering models. Since ice clouds may consist of a variety of non-spherical particles, the question of which crystal shape(s) should be used is a matter of debate. Here we analyse retrievals of crystal size and optical thickness for different hexagonal crystal shapes. We change the degree of crystal imperfectness and magnitude of the aspect ratio (the ratio of the two principal crystal axes). The analysis is performed on the basis of ATSR-2 reflectance measurements made over a tropical cirrus anvil in the area of the southern Pacific Ocean. We employ 0.87 and 1.6 ?m reflectance data for both nadir and forward viewing direction of ATSR-2. Emphasis is laid on the degree of consistency of nadir- and forward-derived optical thickness and crystal size. The analysis learned that, by varying the degree of crystal imperfectness, we could not obtain consistent retrievals of both crystal size and optical thickness for the nadir and forward viewing direction of ATSR-2. The same conclusion was reached for varying the crystal aspect ratio. Disregarding the nadir/forward inconsistency, retrievals are possible for a broad range of aspect ratios. However, by considering an existing relationship between crystal size and aspect ratio, it

	appeared that most of the retrieved combinations of crystal size and aspect ratio are inconsistent with this relationship.

Correlations between altimetric sea surface height and radiometric sea surface temperature in the South Atlantic

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	In the last decade, satellite altimetric measurements of sea surface height (SSH) and infrared radiometric measurements of sea surface temperature (SST) have provided a wealth of information about ocean circulation and atmosphere-ocean interactions. SSH is a depth-integrated quantity dependent upon the temperature and salinity structure of the water column and on the depth independent barotropic contribution. SST from infrared radiometers is a surface parameter representing the temperature of the top few microns of the ocean surface. Hence any relationship between SST and SSH provides dynamical information about the coupling between the ocean surface and subsurface. It also offers a promise of new techniques such as interpolating SSH data using SST and of improved calculations of eddy kinetic energy. We use SST data from the along-track scanning radiometer on ERS-1 and SSH data from the TOPEX/POSEIDON instrument to examine the relationship between SST and SSH anomalies within the South Atlantic region for 1993 and 1994. We find that positive (=0.2-0.6) spatial cross correlations between SST and SSH anomalies at zero lag are present throughout the region at large scales (wavelengths >1000 km). Small-scale correlations, however, are high (=0.7) only in areas associated with fronts and mesoscale variability. These small-scale correlations are seasonal, being strongest in winter and weakest in summer. We discuss the application of these correlations to various techniques requiring the synergistic use of SSH and SST data.Co-authors:Matthew S. Jones, Southampton Oceanography Centre, UK.Myles Allen, Rutherford Appleton Laboratory, UK.Mark Saunders, Univesrity College London, UK.

Pre-Launch Calibration of AATSR

Abstract Number: 23

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Theme:	Poster
Absract:	The methods and results of the pre-launch AATSR calibration testing are described. These include the field-of-view measurements, visible and infrared radiometric calibrations. The visible channel tests included the absolute radiometric responses, calibration of the VISCAL unit and polarisation sensitivity. The calibration of the 12µm, 11µm and 3.7µm channels were verified over a range of target temperatures between 210K to 315K and corrections derived for detector non-linearity. Tests were also performed to determine any scan dependent variations and any effects due to changes in the thermal environment.Co-Authors:J. Delderfield, D. Drummond, T. Edwards, J. Godfrey, C.T. Mutlow,P.D. Read, G. ToplisSpace Science Department,CLRC Rutherford Appleton Laboratory, Chilton, Didcot, Oxon, UK OX11 0QX

Some results from the project: AOT E 301; ACCURATE REMOTELY SENSED OBSERVATIONS OF SEA SURFACE ARROUND CANARY ISLANDS.

Abstract Number: 24

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)

Absract:	Javier Pérez-Marrero and Octavio LlinásABSTRACT:The aim of the project was to explore the improvement introduced in the study of oceanic phenomena in the area of the Canary Islands and the Northwest African coast by the joint use of ATSR and AVHRR to estimate SST.The approach is to make comparisons of satellite derived sst with in situ measurements of temperature and other oceanic parameters, such as salinity and density. These comparisons were made at meso (Km, hours) and seasonal (111 Km, month) scales over a region limited by the island of Gran Canaria and the northwest african coast. Thus encopassing two different oceanic environments: Open Ocean and Upwelling areas.Monthly mean values from 1991 to 1995 were used to derive a typical year at 1x 1 degree scale from ATSR SST, AVHRR SST and in situ measurements.Generally ATSR algorithm gives lower values compared to AVHRR, the magnitude of the difference in open ocean areas was very stable throughout the year at arround 1.4ºC, while in the upwelling areas mean differnce showed strong seasonality. In the same manner the linear regression coeficient between both time series was higher in the oceanic areas (r2 above 0.9) than in the upwelling zone (r2 about 0.65). By means of comparison of both satellite derived averaged years with independent in situ measurements we extracted the mean relative error distribution between both sensors which to be related to latitude and time of the year within the studied area.We also compared satellite derived SST's and in situ data at mesoscale for the same region, the differences found between both sensors were rather similar to the ones found at seasonal scale. Although the dual viewing geometry of ATSR induced a sort of patchiness on the imagery,this was removed after finding that the amplitude of this noise was aproximately 0.25ºC, and vanished for spatial scales larger than 17 Km. Given the great similarity between the detector response functions for the infrared channels AVHRR and ATSR, the diferences in temperature estimations are atributable to the diferent behavoir against atmospheric phenomena specially under influence of saharan aerosols that are quite frequent in the studied region.The use of both sensors as a constellation allows the study of high frequency patterns in SST which are related to heat transfer procceses across the air-sea interfase and also to the dynamics of shallow water masses.

Comparisons between ATSR derived SSTs and AVHRR SSTs

Abstract Number: 25

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Theme:	Data Processing (atmospheric correction) and Merging (e.g. with AVHRR data)

Absract:	ATSR SSTs were downloaded between 1992 and June of1996. The data were averaged onto 1 degree by 1 degeebins and 7 day periods. AVHRR SSTs data for the same periodof time were binned onto an identical space-time grid.The AVHRR SST are part of the reprocessing effort ofthe historical AVHRR data set, funded by the NOAA/NASAPathfinder Project.Preliminary results indicate good agreement on largescales between the two SST data sets. Highs in variability(>5 degrees) are clearly visible in areas of the WesternBoundary Currents. In addition ATSR SSTs indicatehighs exist off the Western Coast of North Americain the Pacific and off the African Coast in theAtlantic.Average differences between the two SST data sets indicate that the AVHRR SSTs are in general onedegree warmer than the ATSR SSTs. Exceptions dooccur in areas such as the Florida Current.An annual cycle in the residual as defined by(AVHRR SST - ATSR SST) occurs, with maxima valuesappearing in the mid to high latitudes and theNorthern and Southern Hemisphere are out of phase.More work needs to be done on regional scales tounderstand the differences bewteen the two datasets and whether they can be explained by aerosoland skin-bulk temperature differences.

Mapping Aerosol Optical Depth over Europe using ATSR-2 data

Abstract Number: 26

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Theme:	Atmospheric Applications and Meteorology, Cloud detection
Absract:	Cristina Robles, Pepijn Veefkind and Gerrit de LeeuwAlgorithms have been developed to retrieve aerosol optical depth over sea [Veefkind et al, 1998b, 1999] and over land [Veefkind et al., 1998a], using ATSR-2 data. Over land, the dual view capability of ATSR-2 is used to eliminate the influence of surface reflections on the radiance received by the radiometer. Aerosol optical depth can only be retrieved in cloud-free conditions. To ensure this, a semi-automatic cloud screening algorithm is applied. The dual view algorithm has been used to map the aerosol optical depth over Europe in August 1997. The results are validated by comparison with available sun-photometer data. The maps will be used together with data obtained from aerosol-transport-chemistry models. For easy comparison, the original optical depth results on a 1x1 km2 grid are re-sampled on the model grid size. Results show large gradients in the aerosol optical depth over Europe, and regions with high pollution levels are clearly visible.References:J.P. Veefkind, G. de Leeuw and P.A. Durkee (1998a). Geophys. Res. Letters. 25(16), 3135-3138.J.P. Veefkind and G. de Leeuw (1998b). J. Aerosol Sci. 29, 1237-1248.J.P. Veefkind, G. de Leeuw, P.A. Durkee,

	P.B. Russell and P.V. Hobbs (1999). J. Geophys. Res. 104 (D2), 2253-2260.

Exploitation of the Synergy between ERS ATSR-2 and GOME:a comparative analysis of ATSR temperatures and reflectances with GOME NO2 data to investigate the pollution effects of burning activities.

Abstract Number: 27

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Theme:	Poster
Absract:	P. Colagrande(1), A. Buongiorno(2), S. Casadio(3), C. Zehner(2)(1)VITROCISET S.p.A under contract to ESA-ESRIN, Frascati, Italytel. +39-6-94180598 - fax +39-6-94180862 - email paola.colagrande@esrin.esa.it(2)ESA/ESRIN, Directorate of Applications, Remote Sensing Exploitation Dept.tel. +39-6-94180544/545 - fax +39-6-94180862 - email Alessandra.Buongiorno@esrin.esa.it / czehner@esrin.esa.it (3)SERCo Servizi s.r.l. under contract to ESA-ESRIN, Frascati, Italytel. +39-6-94180594 - fax +39-6-94180862 - email scasadio@esrin.esa.itABSTRACTThe capability of Along-Track Scanning Radiometer Near IRfrared and VISible channels to detect the presence of fires during the night on the bases of 3.7 mm channel saturation and smoke detection during the day by VIS channels has been used to retrieve useful information to be compared in synergy with Global Ozone Monitoring Experiment monitoring of trace gases concentration in the atmosphere in relation to fire events.ATSR Rush and SADIST-2 images produced for fire detection and GOME level 2 products have been used to investigate the variation of the NO2 trace gas columnar concentration associated to the anthropogenic activities and burning biomass.Both the ATSR-2 and GOME results are in good agreement and are discussed in terms of image analysis and statistical and error analysis respectively.REFERENCES:{1} ESA WPP-108, "GOME Geophysical Validation Campaign", 1996{2} Buongiorno at al. : Earth Observation Quarterly, N 56-57, pag. 1-5, December 1997

Sea Surface Temperature Validation Results from the MUBEX'97 Experiment

Abstract Number: 28

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	Co-authors:Dr. Isabelle Parkes (Leicester University)Prof. David Llewellyn-Jones (Leicester University)Dr. Tim Nightingale (RAL)Dr. Sumio Tanba (formally at University of Iwate)Prof. Ryuzo Yokoyama (University of Iwate)This paper describes the results of field measurements obtained in Mutsu Bay, Japan (latitude 41N, longitude 141E) during a 7 week period in July/August 1997. Ship-borne measurements of temperature (radiometric and bulk) are compared with ATSR sea surface temperatures derived from single and dual look algorithms. These results are compared with validation points from other campaigns and the implications of resulting discrepancies are discussed. Keywords: ATSR, ocean-atmosphere interface, sea surface temperature, validation, skin-effect, remote-sensing

An automated processing system for cloud-top height and amount from ATSR(2) stereo.

Abstract Number: 29

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Theme:	Atmospheric Applications and Meteorology, Cloud detection

Absract:	Muller, J.-P., Dundas, R., Bower, D.A pre-operational algorithm and associated IDL processing chain for fully automated retrieval of cloud-top height and amount from dual view ATSR(2) has been developed. This processing chain includes ingest of SADIST formatted data especially all orbital position and camera viewing angles, automated stereo matching and transformation into ground co-ordinates above the WGS84 ellipsoid. Five different stereo matchers are currently included for testing: M2 (mean of the normalised differences within a patch), M3 (median of the normalised differences within a patch), 2D Nested Maximum (a peak-valley correlation algorithm) P-Gotcha (a Pyramidal version of an in-house Adaptive Least Squares Correlation routine using sheet-growing) and CDWT (a Complex Discrete Wavelet Transform). An assessment of these different stereo matchers is presented which indicates that M2 satisfies the requirement for high throughput (<1 minute/ATSR scene) and pixel-level accuracy with an acceptable blunder-rate (c.1-5%). Examples will be shown of the application of this processing scheme to a wide variety of different ATSR(2) images. The scheme has been applied to the retrieval of cloud amount through the use of a ground Digital Elevation Model and initial results indicate better cloud masking than existing schemes based on radiometry. A companion paper (Muller, Dundas, Vogt, Clothiaux, 1999) describes the quality assessment procedure in more detail. This work is supported by the EU under the Fourth Framework Programme CLOUDMAP Project (Contract No. ENV4 CT97-0399) and by ESA under data grant AO3-422.

Quality assessment of cloud-top height derived from ATSR(2) stereo using ground-based multi-frequency radar and laser ceilometer data at the UK Chilbolton Radar Facility during CLARE98.

Abstract Number: 30

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Theme:	Poster

Absract:	Muller, J.-P., Dundas, R., Vogt, C., Clothiaux, E. (Pennsylvania State University)Validation of cloud-top properties such as height (CTH hereafter), can be performed in a number of different ways. Traditionally, operators of geostationary satellites, such as METEOSAT have used in situ measurements from radiosondes of the temperature-pressure profile to validate CTHs. However, these profiles may be unrepresentative of actual conditions within a cloud and are frequently separated by tens of Kms from where the CTH measurement is performed. Aircraft measurements, particularly from downward pointing laser altimeters may also be used for occasional validation campaigns. However, it is our hypothesis that the only method capable of delivering a long-term validation of CTH will be ground-based combined radar-laser measurements from a network of measuring sites. To test this hypothesis we show results obtained in and around the ESA-sponsored CLARE98 field campaign over a multi-instrumented site at Chilbolton. Multi-frequency (3, 35, 94GHz) radar has been combined with laser ceilometer data using the approach pioneered by Clothiaux and colleagues for the US ARM sites. This multi-data fusion reduces errors associated with hydrometeor reflection (for radar) and poor CTH detection thresholds (for laser). Several ATSR2 stereo-pairs have been reduced to CTH using the techniques and automated processing system discussed in a companion paper (Muller, Dundas, Bower, 1999). We present initial results of the strengths and limitations of using ground-based radar-laser data for validation of CTH. This work is supported by the EU under the Fourth Framework Programme CLOUDMAP Project (Contract No. ENV4 CT97-0399), by ESA under data grant AO3-422 and by the NERC for access to CRF data.

Validation options for AATSR sea surface skin temperature obsrvations

Abstract Number: 32

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Theme:	ENVISAT AATSR (mission, instrument, project plans)
Absract:	A poor AATSR sea surface skin temperature (SSST) validation strategy will compromise the quality of the AATSR mission because of an inability to quantify appropriate SSST product confidence limits. This presentation reviews some of the options and strategies that are available for the on-going validation of AATSR SSST measurements. Particular empahsis is placed on the use of new autonomous ship of opportunity systems and for particular circumstances, use of existing oceanographic SST observational infrastructure. The presentation highlights the need for a co-ordinated, cost effective strategy.

Extratropical planetary waves observed in the ATSR global sea surface temperature record

Abstract Number: 33

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	Katherine Hill, Ian Robinson and Paolo CipolliniThis paper examines the characteristics of planetary wave signatures that have been found in the ATSR ASST dataset for the period 1991-1996. Global latitude-time plots have been produced for every latitude between 5 and 50?, N and S of the equator. Westward-propagating wavelike patterns are found in many locations throughout the World Ocean. Preliminary examination of the wave speed and its variation with latitude suggests that the waves behave like baroclinic Rossby waves. A 2D Radon transform method was developed in order to analyse more objectively the wave speed and its variation with location and time. The resultant spatial distribution of velocity estimates broadly matches the theoretically predicted Rossby wave speeds and those measured by TOPEX altimetry, but there are consistent discrepancies. At low latitudes the thermally detected speeds are slower than expected. This may be related to the mode preferentially revealed by the thermal signature, or may be a consequence of the 1-month sampling interval of the data. The clarity of the RW signatures also follows a distinct pattern; wave signatures are found to be strongest between 25? and 40? S, where the meridional temperature gradient is strongest. Planetary wave speed is also found to vary considerably with longitude. In general there is an increase towards the west of ocean basins, consistent with the findings of recent theory. Distinct differences in speed between ocean basins are evident, as well as random velocity variations. The propagation characteristics of the waves also appear to be interrupted or to change at boundaries in mid-ocean. Further inspection shows these to be correlated consistently with latitudinal variations in sea floor bathymetry, particularly mid-ocean ridges. The work demonstrates the value of the ASST data set as a tool for studying basin scale wave processes as a complement to the use of altimetry. By observing the thermal signature of Rossby Waves the method is able to clarify their influence on air-sea interaction processes, and therefore promises to make a useful contribution to climate modelling studies

Validation of satellite-derived ocean skin temperatures using the M-AERI.

Abstract Number: 34

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	Peter Minnett and the M-AERI team Division of Meteorology and Physical Oceanography Rosenstiel School of Marine and Atmospheric Science University of Miami 4600 Rickenbacker Causeway Miami, FL 33149As with any geophysical measurement, a careful assessment of the accuracy of the ATSR sea-surface temperature retreivals is a pre-requisite of the application of ATSR data. Failure to determine the accuacy limits could lead to erroneous conclusions being drawn, and a convincing validation can persuade the skeptic of the value of the data. Using the Marine-Atmosphere Emitted Radiance Interferometer (M-AERI), ocean skin temperature measurements can now be made in a routine fashion from ships with an absolute uncertainty of less than 0.1K. This level of accuracy permits the validation for the atmospheric correction algorithms applied to AVHRR and ATSR data to retrieve Sea Surface Temperature. Following a brief description of the M-AERI, measurements of the skin effect and diurnal thermocline will be discussed in the framework of satellite SST validation. Examples of validation data from recent cruises will be presented.

MONITORING THE SOUTHERN NORTH SEA "CLEAN SEAS" SITE USING A COMBINATION OF REMOTE SENSING TECHNIQUE

Abstract Number: 35

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	Helen Snaith, James Rennell Division for Ocean Circulation and Climate, Southampton Oceanography Centre,European Way, Southampton SO14 3ZH, U.K.Tel: +44 (1703) 596410, Fax: +44 (1703) 596400email: h.snaith@soc.soton.ac.uk,www: http://www.soc.soton.ac.uk/JRD/SAT/CSeas/Vittorio Barale, Space Applications Institue, Joint Research Centre, Ispra, ItalyMartin Gade, Institute für Meereskunde, Universität Hamburg, Hamburg, GermanyAntoine Mangin, ACRI, BP234, F06904 Sophia Antipolis Cedex, FranceGordon Jolly, Satellite Observing Systems, Godalming, UKOve Rud, Remote Sensing Laboratory, Dept. of Physical Geography, Stockholm University, SwedenClean Seas is a European Environment programme designed to evaluate the contribution that present and future satellite systems can make to monitoring marine pollution. The "Clean Seas" approach is to make systematic measurements over three coastal zones (Gulf of Lion, Southern North Sea and Southern Baltic Sea) to build an archive of repeat observations. Numerical models are used to attempt to aid in the understanding and prediction of some of the features seen in the archives. Here we present some results from case studies for the North Sea site. A suite of sea surface temperature (SST), ocean colour and synthetic aperture radar (SAR) data have been collected for the North Sea test site, covering the two year period from December 1996 - November 1998. Several case studies have been examined within this archive to look at spreading of water from the Rhine estuary, SST (from ATSR and AVHRR measurements) clearly shows the extent of the continental water mass along the coast of Holland, and changes in this water mass due to local heating effects. The ocean colour imagery (MOS, OCTS and SeaWiFS) show high sediment and chlorophyll concentrations associated this water mass. The SAR imagery shows several stationary features which can be attributed to interaction of the tidal currents with bathymetry, as well as more transient features attributable to the circulation, biological activity (natural oil slicks) and anthropogenic sources (ships and mineral oil spills). A model has been developed to recreate the dynamics and sediment concentrations as observed during these case studies and some

On the use of ATSR satellite images for wind resource assessment

Abstract Number: 37

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Theme:	Atmospheric Applications and Meteorology, Cloud detection

Absract:	Charlotte Bay Hasager, M.Sc., Ph.D.Risoe National LaboratoryDept. of Wind Energy and Atmospheric PhysicsDK-4000 Roskilde, Denmark AbstractWind resource assessment in arid and semiarid environments is linkedto wind climatology and surface parameters e.g. desertification andaeolian processes. In-situ meteorological measurements at severallocations in East Egypt along the Western coast of Gulf of Suez arecollected in a Danish-Egyptian project designed for planning thesiting of large wind turbine parks. Spatial information on parametersuseful for the wind climatology mapping will be retrieved from ERSSAR, ERS ATSR and Landsat TM scenes. ATSR land and sea surfacetemperatures and albedo will aid the description of coastal windsystems through the seasons. Images from 1996 and 1997 are used fortypical morning and nighttime climatological conditions.

ATSR Burned Surface Detection Algorithm

Abstract Number: 38

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Theme:	Vegetation, Forestry, Landuse
Absract:	The scientific community requests an assessment of fire effects,like gas emissions and landcover changes. For so doing, vegetation type and state as wellas the extent of the burned surfaces are requested.This research investigate the best method for estimation of burned area from vegetation fire by ATSR-2 data at regional scale. A set of six different algorithms had been identifiedand everyone produces a map of burned surface.All tests are based on an adaptative algorithm.This allows to minimize problems that arises from the different atmospheric condition, angle of view or vegetation cover type in the scene under analysis.Results are investigated and validated against a set of nine TM images.This method, together with other developed at EU/JRC and University of Lisbonwill be tested in different continents in order to achieve a common global algorithm.This exercice is part of the ERS-AO3 as AO-329.

Validation Plans for AATSR

Abstract Number: 41

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	D Llewellyn-Jones, I M Parkes, M D Steven, C T Mutlow, C J Donlon, J Foot, A F Prata, I Grant, T Nightingale Effective and usefulness validation of modern space sensors requires the use of carefully controlled procedures, together with robust an stable ground-based instrumentation. Procedures are also needed to ensure that the results of validation exorcises are properly taken into account in the treatment and management of the data and, in some cases, the instrument itself. These issues are being addressed in the context of the AATSR validation plan, which will be described and discussed in outline.

Derivation of Cloud Parameters for GOME from ATSR-2 Data

Abstract Number: 42

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Theme:	Atmospheric Applications and Meteorology, Cloud detection
Absract:	The ATSR-2 and GOME instruments have been operated in compatible viewing modes on the 4th, 14th and 24th of eachmonth starting on 24th March 1998. On these days, GOME's three 80km-wide across-track pixels are encompassedeverywhere on the globe by the 512km ATSR-2 swath. Relative errors in radiometric calibration and pointing have previously been determined by comparing spatially-averaged reflectances in the three ATSR-2 visible channels with spectrally-averaged reflectances at equivalent wavelengthsmeasured by GOME.A method has now been developed exploiting the three ATSR-2 visible channels to determine the "scene type" of each pixel in the "GBROWSE" data (ATSR-2 images sampled at 4x4km). For each scene-type occurring within each 40km x 80km GOME pixel, histogrammes are produced of visible reflectances and IR brightness temperatures, from which a number of cloud and surface parameters are estimated. Two independent methods are used to estimate cloud-top height for each ATSR-2 pixel designated as cloudy. One method uses the 12 micron brightness temperature in conjunction with the UKMO analysed temperature field. The other method uses parallax, exploiting the ATSR-2 dual view.Results from this work will be presented.Co-authors P.D.Watts, B.J.Kerridge, R.Siddans.

ATSR SST observations of Kelvin and Rossby waves compared with TOPEX/Poseidon Sea level anomaly

Abstract Number: 43

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	co-author S.P.LawrenceASST data is investigated alongside TOPEX/Poseidon sea level anomaly data, to determine the characteristic signature of Kelvin and Rossby waves in each data set.

Combination of ATSR, altimeter and ocean colour observations to study circulation and its effects on biology in a mesoscale area

Abstract Number: 45

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)

Absract:	Paolo Cipollini, Helen M. Snaith, John T. Allen, Steven G. Alderson, Trevor H. GuymerIn this work we combine observations from the ATSR infrared radiometer, ERS-2 and TOPEX/POSEIDON altimeters and the OCTS ocean colour sensor in order to study the circulation pattern in the Alboran Sea, Western Mediterranean, and its effects on phytoplankton distribution. The data have been integrated with in-situ observations taken during the OMEGA observational campaigns in October and December 1996. The Alboran gyre system was very well developed at that time, with both the Western and Eastern gyres and the Almeria-Oran front showing well both in the satellite images and in the in situ measurements. We will show how the data from the different instruments are merged with the sub-surface observations to render a more complete picture of the three-dimensional circulation. This has significant effects on biology as, for instance, nutrients are upwelled and phytoplankton are subject to subduction at the fronts, which are the areas where vertical motion is higher, and consequently those of stronger biological activity.

Use of ATSR data to study Physical Processes in Lake Baikal

Abstract Number: 46

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	S P Lawrence, H Le Core and D Llewellyn-JonesOn account of its size, remoteness and ecological importance, Lake Baikal, the Worlds largest lake, can beneficially be studied from space. Data from ATSR reveal many dynamic features related to deep-water ventilation, which is one of the most important physical processes taking pace within the lake. Another example is the clearance of snow from th ice in the spring, which can also be quantified from ATSR data, and is also of ecological importance because the penetration of light triggers certain biological processes. In all these cases the satellite data must be used in conjunction with additional information abou the sub-surface behaviour of the water. For this reason a 3-dimensional dynamic model for the Lake, the first of this type, is under development. The model is described and preliminary results are shown. It can be seen that such a model, in conjunction with ATSR data, constitutes a very powerful tool for studying this unique and important eco-system.

ANALYSIS OF ATSR-1, ATSR-2 AND AVHRR DATA FOR STUDIES OF GLOBAL SEA SURFACE TEMPERATURE TRENDS AND ANNUAL VARIATIONS.

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Theme:	Climate and Oceanographic Applications (Sea Surface Temperature, Ocean Colour)
Absract:	Per Knudsen and Ole Baltazar Andersen (both at National Survey and Cadastre, Copenhagen NV, Denmark)In studies of Global Change, sea surface temperature data may provide valuable information. Global sea surface temperature data may indicate changes in the heat budget of the oceans. Seven years of low-resolution sea surface temperature data from the ERS-1 and ERS-2 satellites will be studied and compared with low resolution averaged AVHRR sea surface temperature data from the NOAA satellites for consistency and possible differences.

The ATSR and SAR data for vegetation monitoring

Abstract Number: 49

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Theme:	Vegetation, Forestry, Landuse

Absract:	K.Dabrowska-Zielinska, M.GruszczynskaInstitute of Geodesy and CartographyRemote Sensing and Spatial Information CenterJasna2/4, 00-950 Warsaw, PolandThe data applied for the project include ATSR-1, ATSR-2, SAR and AVHRR from 1995, 1996 and 1997 for the agriculture area in western part of Poland. The objective of the study was to characterise the vegetation, their stage, roughness and growing conditions.The visible data from ATSR were used to calculate different indices, which were used to depict the roughness of vegetation.From the surface temperature the indices were calculated which characterised soil moisture conditions. Also on the bases of surface temperature and meteorological parameters measured at the ground stations evapotranspiration was calculated to characterise vegetation - soil moisture conditions at the study area.The SAR backscatter values from the closest time of acquisition were averaged to the area covered with each of ATSR pixel.The ground measurements of vegetation as leaf area index, biomass, vegetation moisture have been carried out. Due to unfavorable weather conditions during the ERS/-ATSR pass for the study area, the cloud free images were for the dates as follows:: (230595, 270695, 90795, 10895, 230796, 110896, 160697, 80797) These three years differed due to moisture conditions.

Fire monitoring

Abstract Number: 50

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Theme:	Poster
Absract:	Goryl, Arino, Buongiorno, Colagrande, Rosaz:Abstract:Following the special fire event in Indonesia andSouth America in 1997 - probably related to El-Nino - ESRINput in place an service to monitor the fires for selected area.From the ATSR-2 thermal channels, hot spot are detected applyingthreshold, then automatically the quicklook, the fire locationand the map are generatedand put on the web (http://shark1.esrin.esa.it)where they are accessible by the users.

El Nino - La Nina observed by ERS' Ra and ATSR

Abstract Number: 51

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Theme:	Poster
Absract:	authors : Katia Cardon, Philippe Goryl, Jerome Benveniste, Remko ScharrooAbstractThe recent El Ni-o Southern Oscillation (ENSO) of 1997/1998 is one ofthe strongest of the century. This event is characterised by abnormallyhigh sea level and sea surface temperature along the west coast of SouthAmerica, near the Equator.With the Radar Altimeter (RA) and the Along-Track Scanning Radiometer(ATSR) on-board the second European Remote Sensing satellite (ERS-2)this event was monitored in high detail. Animations clearly show thedevelopment of the latest El Ni-o. Particularly, the sudden Kelvin waveat its onset is clearly recognised. It can also be seen that this ElNi-o hits the South-American coast actually twice, in July and October1997, and that it is of great magnitude and initiated unusually early inthe year.A new real-time service from Trømsoe satellite station could monitor thesea surface temperature evolution with high precision in near real time.

The New ESA/ESRIN ATSR Near Real Time Service: development, operation and data distribution

Abstract Number: 52

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Absract:	A. Buongiorno ESA/ESRIN Directorate of Application ProgrammesV.Galileo Galilei 00044 Frascati, ItalyPh: +39069418545e-mail; abuongio@esrin.esa.itABSTRACT:To improve the time availability of ATSR products to the user community, ESA/ESRIN has developed a NRT system capable of performing an end to end processing starting from the ERS-2 data downloads.In order to provide the maximum world coverage from the same center, the ATRS NRT has been installed in Tromsoe Satellite Station, by re-hosting the hardware previously used by ATSR-1 NRT project. Differently from the ATSR-1 NRT experience this service is aimed to provide both full and averaged ATSR SADIST products in near real time to users. All products generated are visible and available on-line for being downloaded through a dedicated WWW interface. A description of the service provided is also presented.

Land surface temperatures derived from the ATSR

Abstract Number: 53

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Theme:	Vegetation, Forestry, Landuse
Absract:	Authors: Andrew Shepherd, Earth Observation Science, Leicester University * now at above address ; David Llewellyn-Jones, Earth Observation Science, Leicester University ; John Stewart, Institute of Hydrology, Wallingford * now at Department of Geography, Southampton University Abstract: Terrestrial radiometric surface temperatures were recorded at multiple observation angle in conjunction with satellite overpasses of the Along Track Scanning Radiometer (ATSR) over a region of Zimbabwe. The experimental site extended over some 1000 square kilometers of flat terrain and was predominantly overgrazed grassland with a characteristically short and sparse canopy. Both in-situ and ATSR derived radiative surface temperatures exhibited a pronounced angular dependence over the grass canopy, with differences of up to 5 degrees C between measurements at nadir and forward (55 degree) zenith angles. This effect has been attributed to the temperature differentials that exist within heterogeneous canopies, which typically display variations in vegetation cover related to the observation angle. A simple two component canopy architecture was coupled with a linear mixture model to partition the ensemble surface emission. The nadir fractional vegetation cover was estimated to be !!0.60 +/- 0.27 using the multi-angle radiative temperatures, which was in excellent agreement with the value of 0.66 +/- 0.1 determined manually. Empirical equations were derived from the in-situ data which related vegetation and soil temperatures within the grass canopy. These relationships were used to constraint the surface component temperature regime, so that ATSR dual-angle radiative surface temperatures were sufficient to derive the vegetation and soil temperatures and fractional cover. The difference between vegetation and soil temperatures separated using the dual-angle data was greater than 31 degrees C at certain times of the year, and the modal standard deviation for all component temperature estimates was 3.2 degrees C.

The ATSR World Fire Atlas, and a Synergy with POLDER Aerosol Products

Abstract Number: 54

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Theme:	Vegetation, Forestry, Landuse
Absract:	Authors: O. Arino and J. Rosaz, ESA, FrascatiP. Goloup and V. Marchand, Laboratoire d'Optique Atmospherique, LilleA world Fire Atlas is processed from all the ATSR Night Time Data.Three algorithms have been used and will be discussed. The Products is well suited for global change and climatological studies. Its advanteges come from the precise ERS orbit providing a good location of the detected hot spots. The stable ATSR calibration and its precise radiometry provide further assets. The ATSR Fire Atlas products are currently under validation by 30 scientists around the world under the coordination of the IGBP-DIS: AO3-315.Once fully endorsed by the scientific community, this product will be widely availableto the land and atmospheric scientific communities.An example of synergy is provided by analysing the correlation of biomass burning aerosol presence related to the fire distribution. This analysis has been done for the overall life time of POLDER from November 1996 to June 1997.With the AATSR onboad ENVISAT, the ATSR Fire Atlas will provide the first historical calibrated world fire distribution record on a period exceding 10 years.

Animation an Stereo Products from ATSR

Abstract Number: 55

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Theme:	Poster

Absract:	Mohammed Shokr Hao LeAtmospheric Environment Service Flashback Imaging 4906 Dufferin St., Toronto 15 Keefer Court, Thornhill Ontario, Canada, M3H 5T4 Ontario, Canada, L4J 5Y4Imagery data from ATSR-1 and ATRS-2 over the western Arctic region were animated to highlight spatial and temporal processes in the sea ice cover over the winter season of 1995/1996. Statistics of leads and polynyas occurring at a scale of a few kilometers were determined and the large scale gyre dynamics can be identified for the first time at the fine spatial scale of ATSR (finer than AVHRR). Stereo images are generated from the two ATSR views to show cloud cover over sea ice. Cloud height can be estimated visually and the ice/cloud discrimination can easily be achieved. Ice surface temperature was calculated, with corrections for atmospheric parameters using the double viewing of ATSR, and compared to temperature estimated from AVHRR. Advantages of using ATSR will be presented. A novel technique of large-size image browsing and animation will be presented within this application.

Monitoring Active Volcanoes using the ERS Along Track Scanning Radiometer

Abstract Number: 56

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Absract:	Martin WoosterDepartment of Geography, King's College London, Strand, London WC2R 2LS.Tel: 0171 873 277 Email: martin.wooster@kcl.ac.uk AsbtractThe 1980's were the worst decade for volcanic disasters this century,with 24000 - 28000 fatalities each associated with two particularlydevastating eruptions (El Chich?n, 1982 and Nevado del Ruiz,1985).Such tragedy shows that the 500+ worldwide active volcanoes continueto represent extreme hazards, despite advances in the technologyavailable for ground-based surveillance. Remote observation fromspace is one method that can assist traditional monitoring efforts,and the ERS Along Track Scanning Radiometer is extremely suitable inthis regard. ATSR makes thermal observations all of Earth'sterrestrial volcanoes once every three days under nighttimeconditions (the ideal time for such measurements to be made) andthese thermal measurements can be related to the amount of hightemperature activity occurring at the volcano in question. Trends inthis activity can indicate variations in the pre-eruptive state ofthe volcano, or can be used to deduce whether ongoing eruptiveactivity is waxing or waning. This poster gives a brief introductionto the techniques used and presents some case studies using archiveddata for test-site volcanoes in Japan and the America's. Theaccompanying poster presents early results where the developedtechniques are being applied in a near-real time basis to monitor

	theongoing eruption at Mount Etna, Sicily.

Application of hierarchical estimation techniques to SSTs from ATSR

Abstract Number: 57

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Theme:	Poster
Absract:	M.J. Murray, M.R. Allen & P.W. Fieguth Production of continuous fields from irregularly and sparsely sampledobservational data is essential for many scientific applications ofremote sensing. For example, atmospheric and oceanic models often requireregularly-gridded sea surface temperature (SST) and other geophysicalfieldsat high spatial and temporal resolution. Traditional interpolationtechniques,such as the Fast Fourier Transform, are not suited to irregularly sampleddata, and optimal interpolation by brute-force matrix inversion isprohibitively expensive for the array sizes involved (modern globalclimate models are running at resolutions as fine as one-sixth degree,corresponding to global fields of 1000x2000 pixels).We describe the application of a multiresolution estimation frame workwhich offers computionally efficient methods for the interpolation,and smoothing of very large data sets; the method alsoprovides realistic error estimates. The technique has recently beenextendedto enable assimilation of SST data over time, and to utilise SSTs fromdifferent sources. We will present results both from using onlyhigh-precision SSTs from the Along Track Scanning Radiometer (ATSR) anddiscuss the issues raised by the planned fusion of ATSR and AVHRR data.

Atmospherical and Optical data processor

Abstract Number: 58

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Theme:	Other

Absract:	ATOP ATmosheric and Optical data Pre-processing reference chain" is a system requested by ESRIN and realised by MATRA Systemes & Information in co-operation with KNMI (Koninklijk Nederlands Meteorologisch Instituut) and CNRM (Centre National Recherche Meteo) and CNRS (Centre National Recherche Scientifique) . It is mainly designed to process and visualise data supplied by a wide range of Earth Observation sensors, especially in order to compare and analyse data coming from different sources. ATOP is an integrated system including data base management tools, with a gateway towards IDL (Interactive Data Language) world.

Comparison of ATSR and NOAA AVHRR hotspot data acquired during an exceptional fire event in East-Kalimantan (Indonesia)

Abstract Number: 12

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Absract:	F. SIEGERT, A. HOFFMANN* & S. KUNTZ+Ludwig-Maximilians-Universität, Dept. Biology, Luisenstr. 14, 80333 München, Germanye-mail: FSiegert@zi.biologie.uni-muenchen.de*Integrated Forest Fire Management Project IFFM / GTZ, Jln. Harmonika, Samarinda, 75001,Kalimantan Timur, Indonesia+Remote Sensing Services GmbH, Wörthstr. 49 82 MünchenBoosted by the 1997/98 El Niño phenomena wildfires have destroyed huge areas of rainforest and bushland in Indonesia. During this exceptional fire event the Integrated Forest Fire Management Project (IFFM/GTZ) received and processed NOAA-AVHRR images with a high temporal resolution. During january to may 1998 the IFFM project detected more than 55.000 hotspots over the area of Kalimantan Timur. IFFM also carried out a study in which multitemporal ERS-2 SAR images were used to map burned scars with high spatial resolution (1,2). Burned scar mapping was verified by extensive field studies during and after the fire event. By importing all ATSR hotspots acquired by ERS into an ARCVIEW GIS project containing all the NOAA AVHRR hotspots and the burned scars mapped by ERS data it was possible to compare the spatio-temporal pattern of hotspots detected by both optical systems and burned scars mapped by ERS SAR. This study was conducted on behalf of ESA/ESRIN. (1) Siegert F. & Rücker G. (1999). Earth Observation Quaterly, 61, 7-12(2) Siegert F. & Hoffmann A. (1999). The 1998 Forest Fires in East-Kalimantan (Indonesia): A quantitative evaluation using high resolution, multitemporal ERS-2 SAR Images and NOAA-AVHRR data.

	Remote.Sens.Environ, in press