



DRAGON

PROGRAMME
2004 TO 2007

XIAMEN SYMPOSIUM, P.R. CHINA



Courtesy of NRSCC 2004

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27 - 30 APRIL 2004

Following a September 2003 meeting in Paris between Prof. Xu Guanhua, Minister of Science and Technology of the Peoples Republic of China (MOST) and Mr Jean Jacques Dordain, Director General of the European Space Agency (ESA), it was agreed that a joint research programme in the field of remote sensing be initiated.

As directors responsible for the programme, Prof. Shao Liqin, Director General of National Remote Sensing Center of China, and Prof. José Achache, Director of ESA Earth Observation Programmes, have stressed the creation of joint Sino-European teams as a means to stimulate scientific exchange in Earth Observation science and technology. As a consequence, a formal programme of co-operation, the "Dragon Programme", has been initiated that brings together investigators from Europe and China.

The **THEMATIC AREAS** under investigation are:

- | | |
|---------------------------|--|
| ■ Agricultural Monitoring | ■ Landslide Monitoring |
| ■ Flood Monitoring | ■ Air Quality Monitoring and Forecasting |
| ■ Forest Mapping | ■ Chemistry/Climate Change in the Atmosphere |
| ■ Rice Monitoring | ■ Forest Information from POLInSAR |
| ■ Forest Fire Monitoring | ■ Drought Monitoring |
| ■ Oceanography | ■ Water Resources Assessment |
| ■ Terrain Measurement | ■ Climate and Ocean Systems |
| ■ Seismic Activity | |

This brochure provides an overview of the projects and relevant points of contact in Europe and in China. We would like to welcome you to the Dragon Symposium which is the kick-off for the Dragon Programme, and wish you all success with your projects. We look forward to collaborating with you and receiving your inputs during the Symposium and your results during the lifetime of the Dragon programme.

The Dragon programme co-ordinators:

ESA - Yves-Louis Desnos, e-mail: yves-louis.denos@esa.int
NRSCC - Li Zengyuan, e-mail: zengyuan.li@forestry.ac.cn

The Dragon programme web site:

<http://earth.esa.int/dragon>

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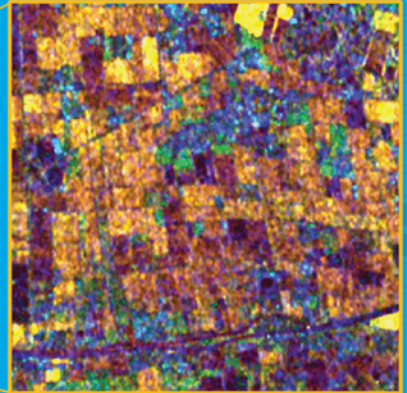
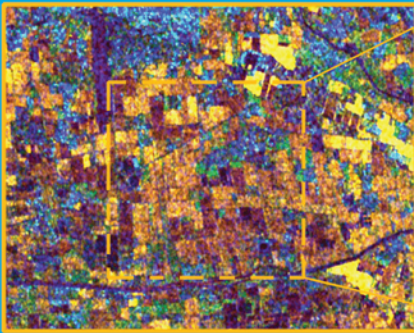
AGRICULTURAL MONITORING IN “FUJIAN PROVINCE”

- : Agriculture and Land Use: ENVISAT Applications in Fujian Province

Pls

Prof. Shaun Quegan, e-mail: s.quegan@shef.ac.uk

Prof. Wang Qinmin, e-mail: qmwang@fzu.edu.cn



Courtesy of Chinese Academy of Survey and Mapping & Remote Sensing Applications Consultants, UK

- : Interferometric Land Use composite (ILU) of Beijing showing the potential of intensity and 35 day + coherence products for land use mapping, South Beijing, China.



RICE MONITORING

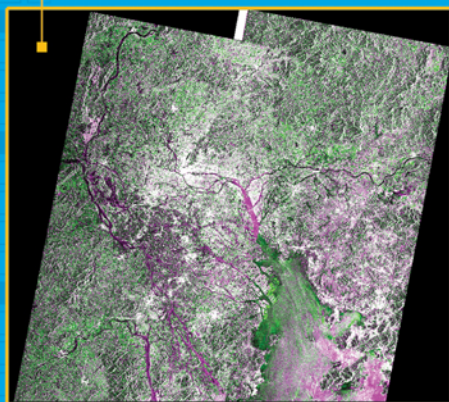
Rice Monitoring in China ::

Pls

Dr. Thuy Le Toan, e-mail: Thuy.Letoan@cesbio.cnes.fr

Dr. Tan Bingxiang, e-mail: tan@forestry.ac.cn

ERS SAR multi-temporal
RGB image mosaic result, Guangdong Province



ERS SAR multi-temporal
RGB image, Jiangsu Province



Courtesy of Chinese Academy of Forestry & Remote Sensing Applications Consultants, UK

:: Rice growing areas can be accurately mapped using multitemporal SAR images. The project explores new techniques using multitemporal, dual polarisation, narrow and wide swath ASAR data to develop robust rice mapping methods applied to large provinces in China (Jiangsu and Fujian). Rice yield prediction models with inputs from both ASAR and MERIS data will be tested. Indications on the seasonal variations of methane emission from flooded rice fields will be studied in relations with SCIAMACHY data.



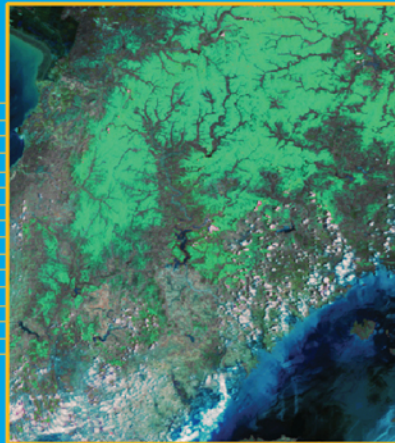
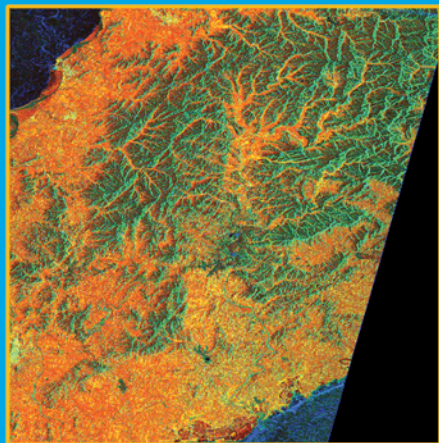
FOREST MAP OF CHINA

- The Forest Dragon (Forest-related Development of Radar Applications for Geomatic Operational Networks)

Pls

Prof. Christiane Schmullius, e-mail: c.schmullius@uni-jena.de

Prof. Li Zengyuan, e-mail: zengyuan.li@forestry.ac.cn



30 May 2003

Band 8 - red

Band 13 - green

Band 5 - blue

- ERS SAR Tandem Interferometric Land Use (ILU) composites have been used to map forest areas in China shown in green (left). New optical imagery from Envisat MERIS (right) can be used to up-date forest maps derived from ILU composites.



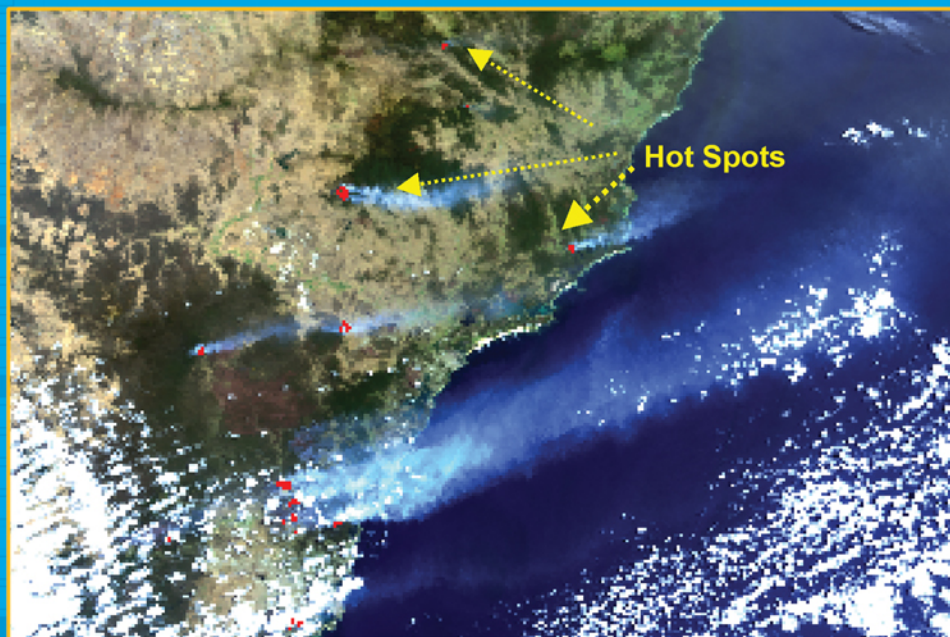
FOREST FIRE MONITORING

Forest Fire Monitoring Demonstration by Satellite Remote Sensing in China ::

Pls

Prof. Jose-Luis Casanova, e-mail: jois@latuv.uva.es

Dr. Qin Xianlin, e-mail: noaags@forestry.ac.cn



:: Fires detected using Envisat AATSR (1km) shown in red, superimposed on a higher resolution MERIS image, smoke rising from the fires can also be seen in the MERIS image.



DERIVING FOREST INFORMATION FROM POLINSAR DATA

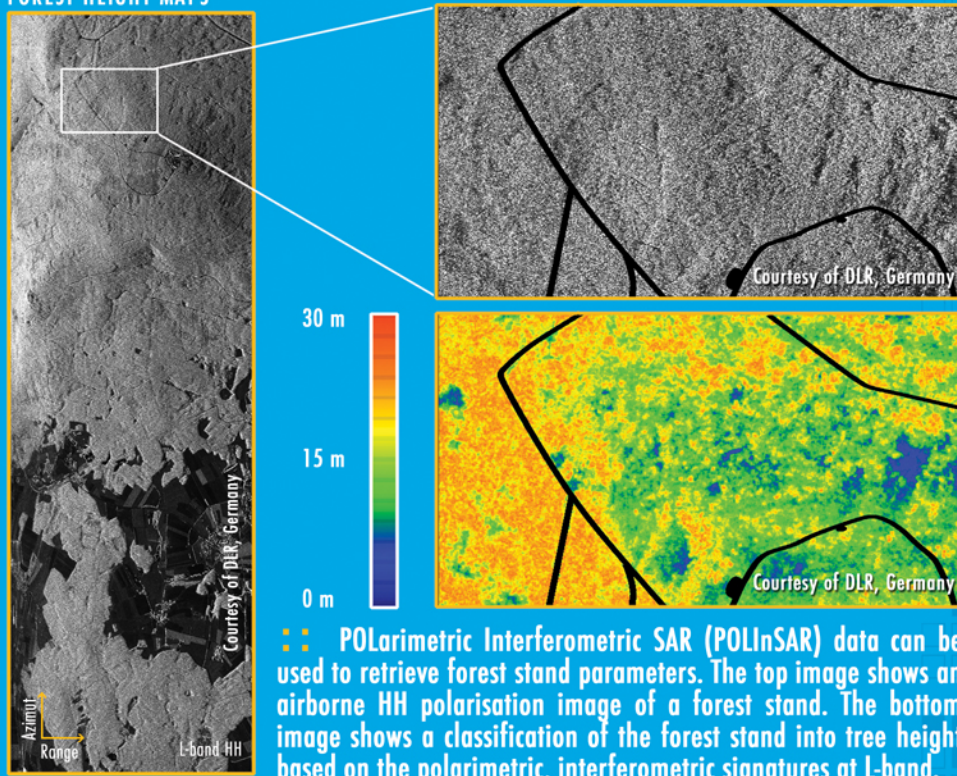
- Techniques for Deriving Forest Information from Polarimetric SAR Interferometry

Pls

Dr. Shane Cloude, e-mail: scloude@eleceng.adelaide.edu.au

Prof. Li Zengyuan, e-mail: zengyuan.li@forestry.ac.cn

FOREST HEIGHT MAPS



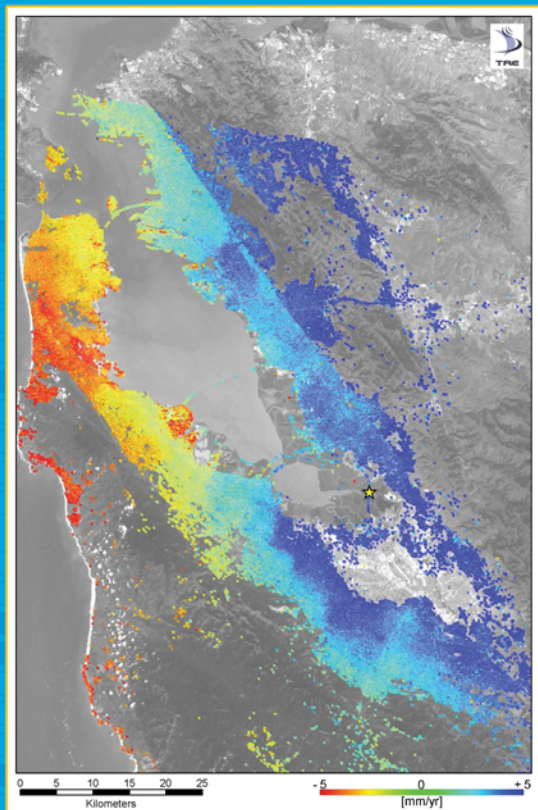
TERRAIN MEASUREMENT

Topographic Measurement ::

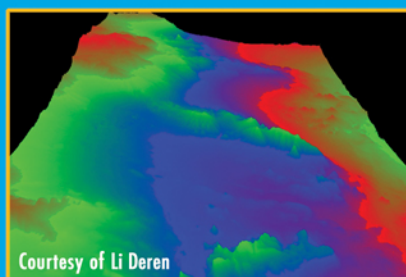
Pls

Prof. Li Deren, e-mail: dli@wtusm.edu.cn

Prof. Fabio Rocca, e-mail: rocca@elet.polimi.it

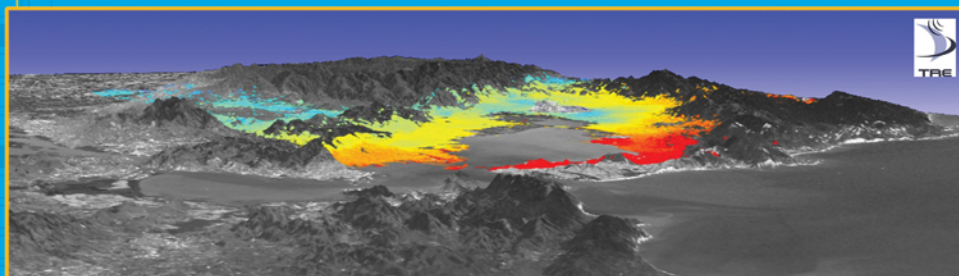


:: The Permanent Scatterers Technique, developed by Politecnico di Milano, is a powerful tool for monitoring ground movements. This image shows the average displacement rate of the radar benchmarks (PS) identified in San Francisco Bay Area. Data refer to the time-interval 1992-2001.



:: Perspective view of DEM generated from repeat-track ERS-1 data, acquired on March 1998, Tibetan Area of China.

Images by Tele Rilevamento Europa - T.R.E. s.r.l. - a POLIMI spin-off company



MONITORING SEISMIC ACTIVITY

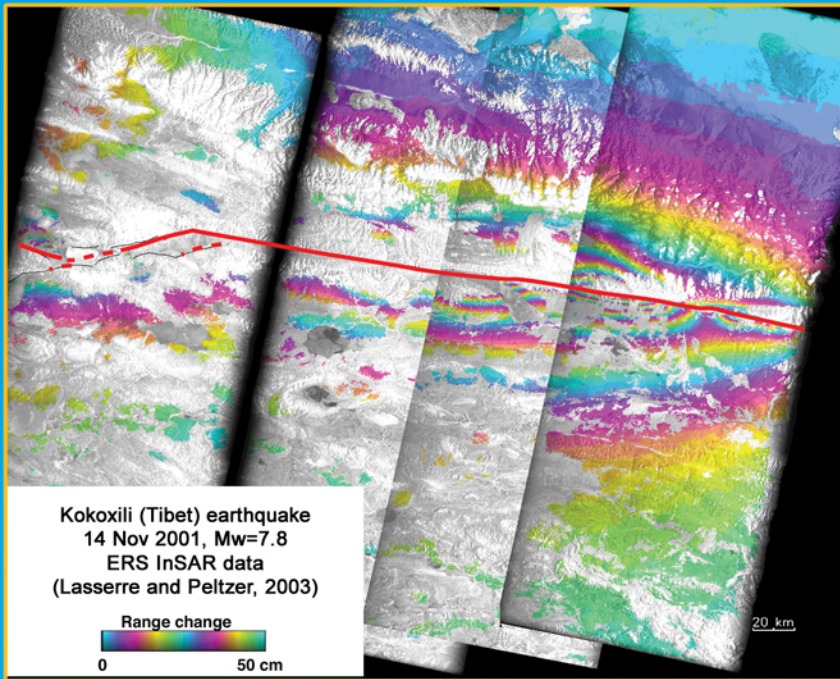
- Seismic and Inter-seismic Deformation Across Two Main Strike-slip Faults of Tibet (the Kunlun and the Haiyuan faults), from Permanent Scatterers InSAR

Pls

Mr. Sun Jianbao, e-mail: sunjb@mail.china.com

Dr. Cecile Lasserre, e-mail: lasserre@geologie.ens.fr

Prof. Xu Xiwei, e-mail: xiweixu@vip.sina.com



- Fault line velocity rate studies can be conducted using multi-temporal permanent scatterers interferometric SAR signatures.



- Surface rupture zone of Kokoxili earthquake crossing Gelmod-Lhasa Road in N80 W direction at the 2894 km road-marker.
(Photo towards the west)

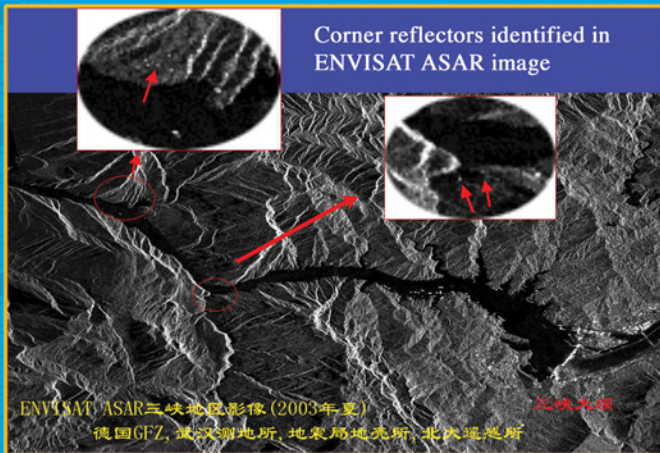
Courtesy of Prof. Xu Xiwei

LANDSLIDE DISPLACEMENT MONITORING

Monitoring Landslides in the Three Gorges Area
by Using Corner Reflector Differential SAR Interferometry

PIs

Prof. Zeng Qiming, e-mail: qmzeng@pku.edu.cn
Prof. Jan-Peter Muller, e-mail: jpmuller@ge.ucl.ac.uk



Corner reflectors have been positioned in valleys along the 3 Gorges Dam area. The reflectors have signatures that are visible in ASAR images (shown left). Using InSAR permanent scatterers techniques, the corner reflectors will be used monitor the stability of slopes and land slides.



Courtesy of Prof. Zeng Qiming

FLOOD PLAIN DISASTER RAPID MAPPING AND MONITORING

- Assessment of the Synergistic Exploitation of Envisat ASAR and MERIS Data for Flood Plain Rapid Mapping and for Flood Support Risk Assessment

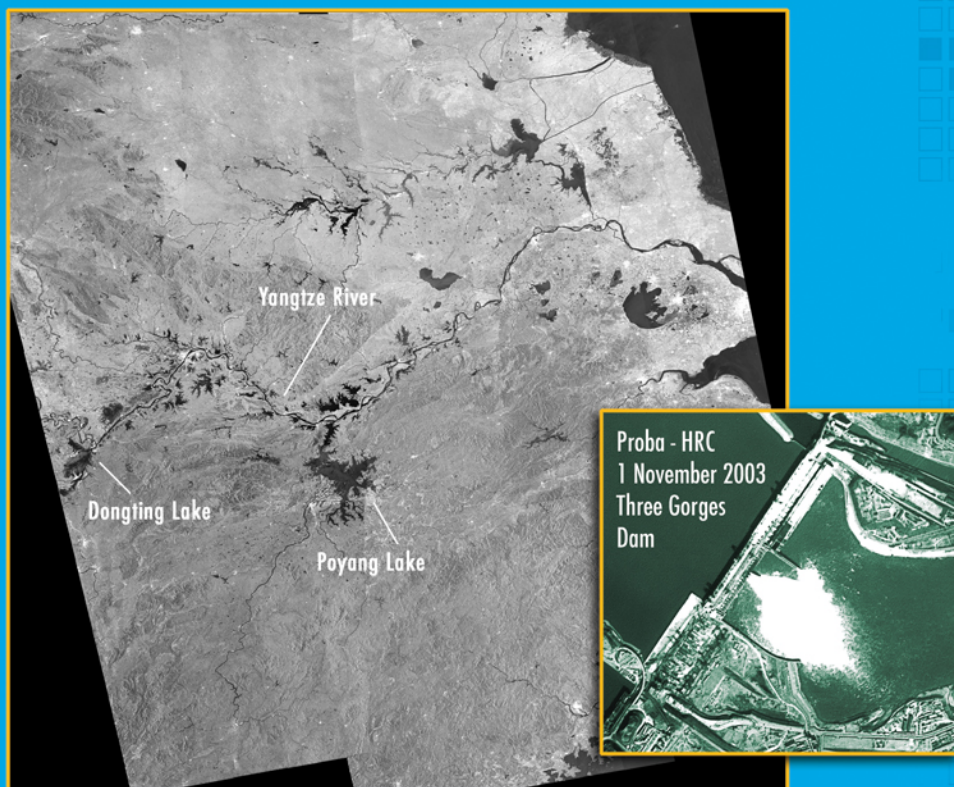
Pls

Prof. Li Jiren, e-mail: lijiren@iwhr.com

Dr. Murielle Costes, e-mail: Murielle.Costes@cnes.fr

Dr. Yesou Hervé, e-mail: herve@sertit.u-strasbg.fr

Dr. Christine King, e-mail: c.king@brgm.fr



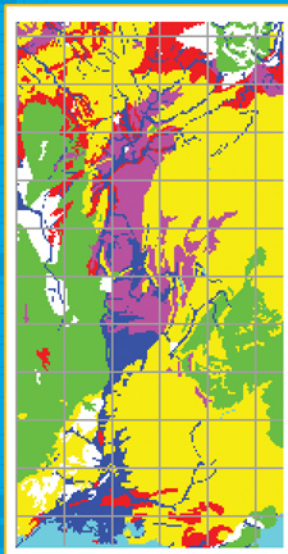
- Envisat ASAR Wide Swath mosaic of Yangtze River China (1200 km east - west, 1200 km north - south). Lakes and rivers have the darkest radar signatures. This area is prone to flooding on an annual basis. The Wide Swath coverage shows the larger area coverage capability compared to ERS SAR scenes.

SATELLITE TOOLS FOR WATER RESOURCES ASSESSMENT

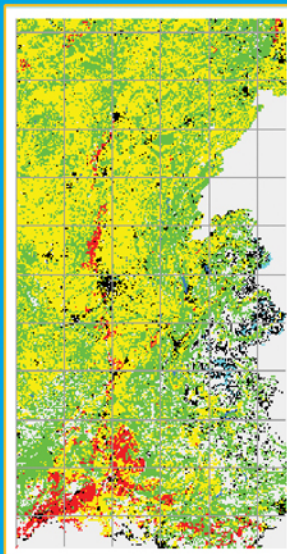
Satellite Tools for Water Ressources Assessment and Management at River Basin Scales :

Prof. Ghislain de Marsily, e-mail: Gdemarsily@aol.com
Prof. Li Jiren, e-mail: lijiren@iwhr.com
Dr. Xin Jingfeng, e-mail: xinjf@iwhr.com

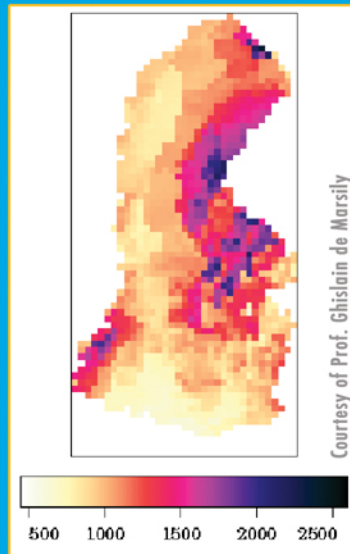
PIs



■ Soil map



■ Vegetation



■ Rainfall

Courtesy of Prof. Ghislain de Marsily

∴ Catchment scale river discharge modelling includes the use of static data layers (soils, geology, slope and land use) with dynamic data (rainfall, snowfall and temperature), top.



Three Gorges Dam

CHINA DROUGHT MONITORING

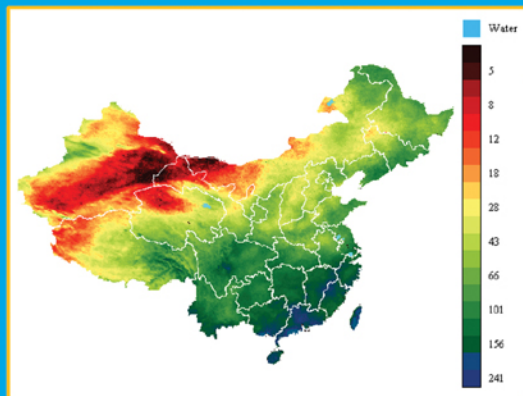
• Drought Monitoring and Prediction Over China

Pls

Prof. Chen Youqi, e-mail: chenyqi@mail.caas.net.cn

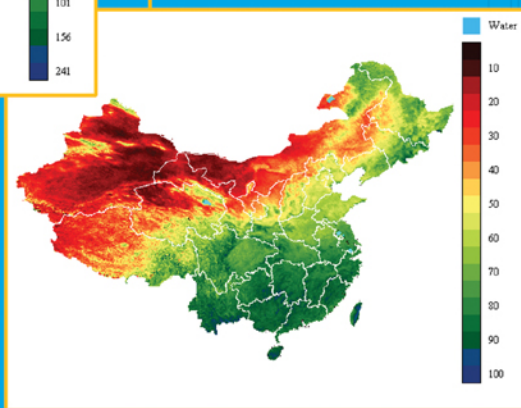
Dr. Z. Bob Su, e-mail: bob.su@wur.nl

DESERTIFICATION PRODUCTS



Climatic Moisture Index (CMI) =
Rainfall / potential evapotranspiration

Soil Moisture Index (SMI) =
Actual / potential evapotranspiration



• Desertification indices can be generated using low resolution remote sensing data in an Energy and Water Balance Monitoring System. The examples provided show desertification indices for the whole of China.



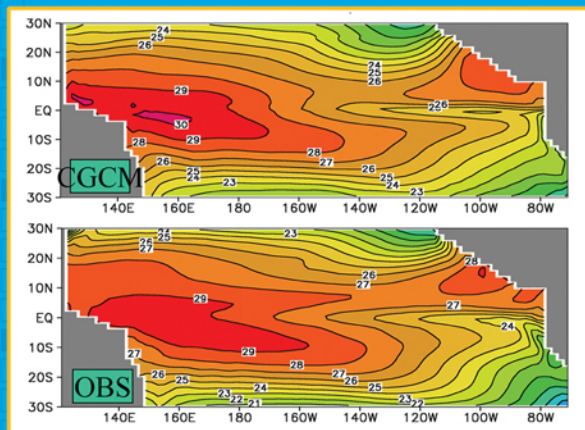
COUPLING CLIMATE AND OCEAN SYSTEMS

Coupling and Variability of the Southeast Asian Monsoon and Ocean Systems (SAMOS) ::

Prof. Johnny Johannessen, e-mail: Johnny.johannessen@nersc.no

Prof. Wang Hui-Jun, e-mail: wanghj@mail.iap.ac.cn

Pls



Simulation of the tropical Pacific sea surface temperature (SST) simulation (top), observation (bottom)

Ocean colour using MERIS FR 21 March 03 (r7, g5, b2) mouth of Yangtze, Shanghai, China



Ocean waves and turbidity using ASAR 14 August 2003, mouth of Yangtze, Shanghai, China

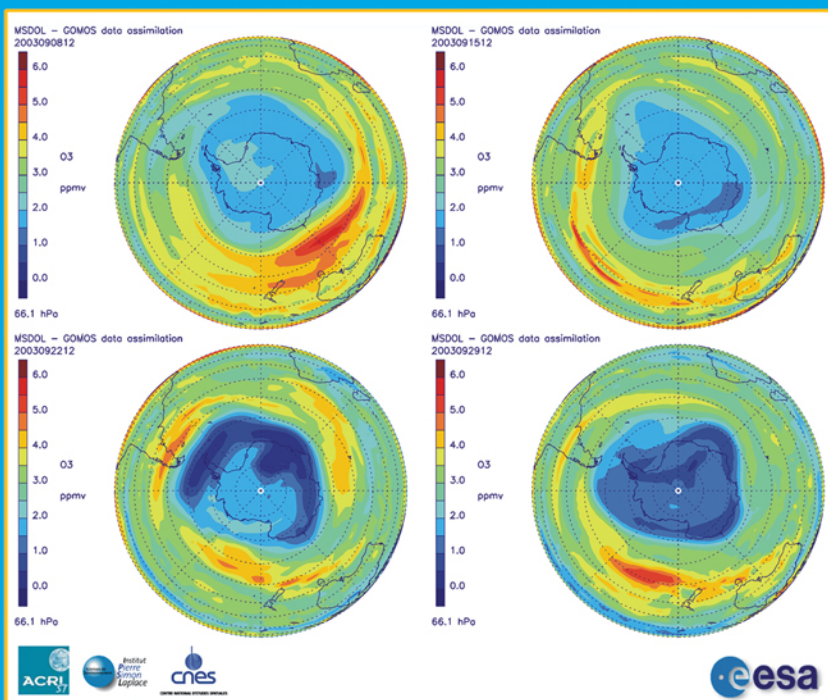
:: The coupled Southeast Asian Monsoon and ocean system is a regular seasonal climate feature that has profound and coupled connection with and impact on the sea surface temperature, evaporation and precipitation signals. By the systematic use of coupled atmosphere-ocean models and inter-comparison and validation with satellite observations the aim of the project is to advance the ability to monitor and simulate the dominant coupled system and interactive processes at the relevant temporal and spatial scales.

CHEMISTRY/CLIMATE CHANGE IN THE ATMOSPHERE

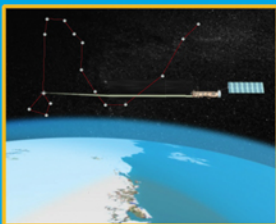
- "DRAGON-STAR" Exploitation of GOMOS Measurements for Studying Changes in the Middle Atmosphere

PIs

Dr. Erkki Kyrölä, e-mail: Erkki.Kyrola@fmi.fi
Dr. Qiu Hong, e-mail: qiu@nsmc.cma.gov.cn
Dr. Bruno Carli, e-mail: B.Carli@IFAC.cnr.it



- Temporal series of GOMOS observations can be used to quantify the depletion of gases such as Ozone in the atmosphere. Antarctic Ozone hole evolution during September 2003 is shown as measured by GOMOS at a pressure level of 66.1 hPa.



- Envisat and GOMOS measuring one of the stars in the Dragon constellation

AIR QUALITY MONITORING AND FORECASTING

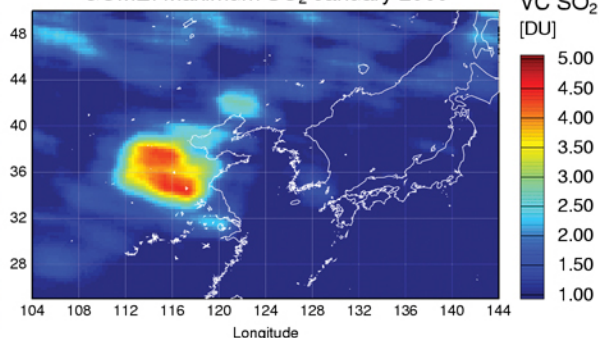
Air Quality Monitoring and Forecasting in China : .

PLs

Prof. Hennie Kelder, e-mail: kelder@knmi.nl

Dr. Zhang Peng, e-mail: zhangp@nsmc.cma.gov.cn

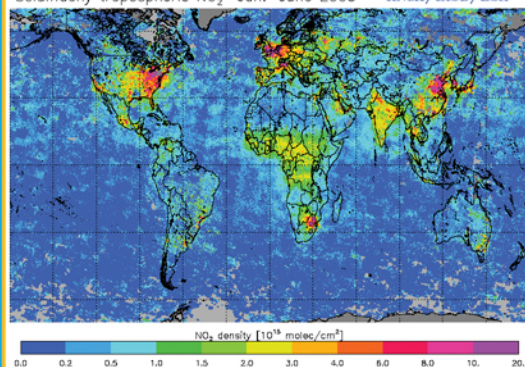
GOME: Maximum SO₂ January 2000



∴ The figure shows SO₂ concentrations in the Troposphere. In this image, high concentrations can be seen to the south of Beijing, China.

∴ Temporal series of satellite observations can be used to show global distributions and concentrations of atmospheric pollutants, in this case NO₂. Notice the high NO₂ concentration around Beijing in China and other major industrialised areas of the world.

Sciamachy tropospheric NO₂ Jan.-June 2003 KNMI/IASB/ESA



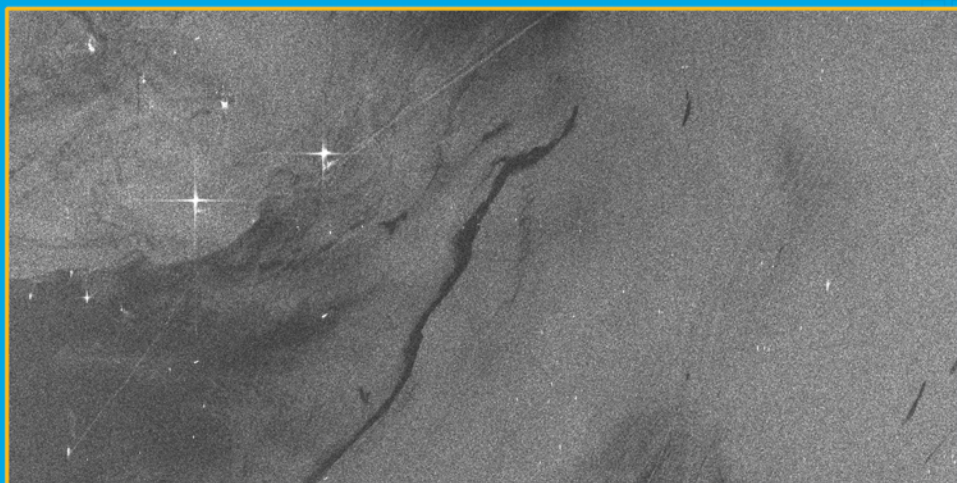
Courtesy of National Meteorological Centre of China

OCEAN ENVIRONMENT AND CLIMATE

- Oceanography from Space --- Internal Wave, Ocean Wave, Shallow Water Topography, Ocean Color, Kuroshio Current

Pls

Prof. He Ming-Xia, e-mail: mxhe@orsi.ouc.edu.cn
Prof. Werner Alpers, e-mail: alpers@ifm.uni-hamburg.de
Dr. Roland Dörffer, e-mail: doerffer@gkss.de
Prof. Andre Morel, e-mail: morel@obs-vlfr.fr
Prof. Jürgen Fischer, e-mail: juergen.fischer@wew.fu-berlin.de
Prof. Johnny Johannessen, e-mail: Johnny.johannessen@nersc.no
Prof. Liu Zhishen, e-mail: zsliv@orsi.ouc.edu.cn,
Prof. Zhang Jie, e-mail: zhangjie@public.qd.sd.cn
Prof. Du Tao, e-mail: taodu@ouc.edu.cn
Dr. Zhang Tinglu, e-mail: zhangtl@orsi.ouc.edu.cn
Dr. Guan Lei, e-mail: leiguan@orsi.ouc.edu.cn
Dr. Zeng Kan, e-mail: zengkan@orsi.ouc.edu.cn
Dr. Meng Junmin, e-mail: mengjm@fio.org.cn
Dr. Fang Mingqiang, e-mail: fmq@orsi.ouc.edu.cn
Dr. Ma Yi, e-mail: mayimail@263.net



- ENVISAT/ASAR images of the East Sea, China.

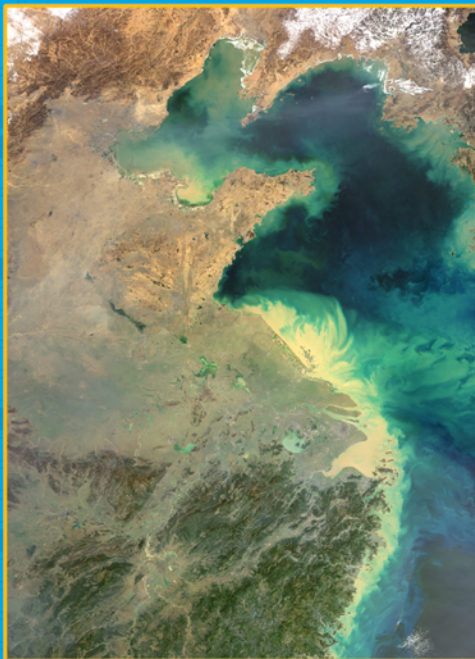
OCEAN ENVIRONMENT AND CLIMATE

Oceanography from Space --- Internal Wave, Ocean Wave, Shallow Water Topography, : :
Ocean Color, Kuroshio Current

OCEAN COLOUR



: : MERIS (r7, g5, b2) full resolution
(300 m), 24 August 2003, image of
the Shanghai area, China.



: : MERIS (r7, g5, b2) low resolution
(1.2 km) image, 15 Feb. 2004, showing
sediment loading and discharge from
rivers along the east coast of China.

List of Chinese and European Institutions Cooperating in the Dragon Programme

AEL Consultants, United Kingdom
Beijing Normal University, China
BIRA, Belgisch Instituut voor Ruimte-Aëronomie, Belgium
BRGM, Bureau de Recherches Géologiques et Minières, France
Cemagref, Institut de Recherche pour l'Ingénierie de l'Agriculture et de l'Environnement, France
CESBIO, Centre d'Etudes Spatiales de la Biosphère, France
Chinese Academy of Forestry, China
Chinese Academy of Meteorological Sciences, China
Chinese Academy of Sciences, China
Chinese Academy of Survey and Mapping, China
China Seismological Bureau, China
Chinese National Center for Disaster Reduction, China
CNES, Centre National d'Etudes Spatiales, France
CNR, Consiglio Nazionale delle Ricerche, Italy
DLR, Deutsches Zentrum für Luft- und Raumfahrt, Germany
Ecole des Mines de Paris, France
Ecole Pratique des Hautes Etudes, France
ENS, Ecole Normale Supérieure, France
First Institute of Oceanography, China
FMI, Finnish Meteorological Institute, Finland
Freie Universität Berlin, Germany
Friedrich-Schiller-Universität Jena, Germany
Fundación General Universidad de Valladolid, Spain
Fuzhou University, China
Gamma Remote Sensing Research and Consulting AG, Switzerland
Georg-August-Universität Göttingen, Germany
GFZ, GeoForschungsZentrum, Germany
GKSS Forschungszentrum, Institute for Coastal Research, Germany
Ifremer, Institut français de recherche pour l'exploitation de la mer, France
INIA, Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Spain
INPT/ENSEEIH, Institut National Polytechnique de Toulouse/Ecole Nationale Supérieure d'Electrotechnique, d'Electronique, d'Informatique, d'Hydraulique et des Télécommunications, France
Institute of Meteorological Sciences, China
Institute of Natural Resources and Regional Planning, China
Jiangsu Academy of Agriculture Sciences, China
KNMI, Koninklijk Nederlands Meteorologisch Instituut, The Netherlands
METEO France, France
Ministry of Agriculture, China
Ministry of Water Resources, China
NERSC, Nansen Environmental and Remote Sensing Centre, Norway
NSMC, National Satellite Meteorological Center, China
Ocean University of China, China
POLIMI, Politecnico di Milano, Italy
RSAC, Remote Sensing Applications Consultants Ltd, United Kingdom
SERTIT, Service Régional de Traitement d'Image et de Télédétection, France
SOGREAH, Société Grenobloise d'Etudes et d'Applications Hydrauliques, France
State Key Lab. for Information Engineering in Surveying, Mapping and Remote Sensing, China
T.R.E. s.r.l., Tele Rilevamento Europa, Italy
TNO/FEL, Toegepast Natuurwetenschappelijk Onderzoek/Fysisch en Electronisch Laboratorium, The Netherlands
UN/ISDR, International Strategy for Disaster Reduction, Germany
Università degli Studi di Pavia, Italy
Universität Bremen, Germany
Universität Hamburg, Germany
Université de Rennes 1, France
Université du Littoral Côte d'Opale, France
Université Pierre et Marie Curie, Paris VI, France
University College London, United Kingdom
University of Sheffield, United Kingdom
Wageningen Universiteit, The Netherlands