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- Note other teams in UKSA deal with data and applications too

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The UKSA EO Vision 2017-2040

To ensure that the UK’s participation in Earth observation is as strong as possible and that it is recognised for the role it can play in delivering a sustainable service based economy.

By 2040 satellite Earth Observations will provide the data underpinning mass market and business applications, global cutting edge science and policy and operational decision making.

Therefore ..we should exploit the fact the UK is the lead funder of EO in the European Space Agency to develop a broad and deep ecosystem of companies big and small dealing in the entire spectrum of earth observation issues from early research and technology development, through manufacture and launch, through the infrastructure and services needed to move, validate -share and interpret the data into a format suitable for use.

We should export EO skills and technologies worldwide, negotiate a new relationship with Copernicus and plug the emerging EO skills gap to fill the jobs that will be created in the UK.
The UK EO Data Group

**Data Vision**
The UK will be a world leading access point for global users, providing trusted, quality assured satellite derived products and delivering growth over the long term by maximising the exploitation of EO data and services by public, academic and private sector users, through a reliable, open, secure and sustainable capability.

**EO Data Group**
In August 2018 UKSA held its first EO Data Group, bringing together key partners across industry, academia and Government to consider issues relating to EO data access and exploitation.

The second meeting was held in November, where we brought together views across the sector to coordinate the UK approach to satellite EO data policy and infrastructure activities.

The group also discussed related groups and activities within Copernicus, CEOS, GEO and ESA with a view to getting a more coherent approach.
• We are looking to develop an improved system based on maximising use of the data by all public, private and academic users, by conducting a full analysis of user requirements including risk assessment of current Ground Segment and looking to agree an ongoing governance structure and investment thereafter.

• Multiple UK entities are specialist in pieces of the system.

• UK want to maximises the use of
  ➢ DIAS
  ➢ ESA activities etc
  ➢ Geospatial and IT revolutions

• Working with GEO and CEOS colleagues on FDA, ARDs, Data cubes, data policies etc to maximise global best practise
The Current Collaborative Ground Segment

Sentinel Data Access Service (SEDAS)

- minimum one year rolling archive of Synthetic Aperture Radar (SAR) data from Sentinel 1A and 1B. (Product Types: GRD, SLC & OCN), as well as Optical data from Sentinel 2A and Sentinel 2B (Product Type: L1C). This data is available for immediate download. Archived data is also available for users to request and download. An API is available for all registered users. Will soon be adding NovaSAR data.

JASMIN – for academic users

- The JASMIN "super-data-cluster" is deployed on behalf of NERC at the STFC Rutherford Appleton Laboratory (RAL). JASMIN supports the data analysis requirements of the UK and European climate and earth system modelling community. It consists of multi-Petabyte fast storage co-located with data analysis computing facilities, with dedicated light paths to various key facilities and institutes within the community.
CEDA (Centre for Environmental Data Analysis) data archive – run by STFC at RAL for NERC.

Mirroring Sentinel data products (5 PB Sentinel data holdings currently):
- Sentinel 1A&B GRD and SLC data
- Sentinel 2A&B: MSI data
- Sentinel 3A: SLSTR (some OLCI and SRAL)
- Sentinel 3B
- Sentinel 5P

Recent data stored online, older data on Near-line Tape Archive (user can easily request)

Search interfaces: Satellite Data Finder (map search tool) and Opensearch API

Compute capability next to the data

JASMIN data intensive computing facility

Recent Phase 4 Upgrade to 44 PB, 12,500 compute cores, with private cloud for flexible usage
JASMIN Usage

• 592 users have downloaded 3.3 TB of Sentinel data in the last 12 months. However, most users will have used the data directly on JASMIN, rather than through downloads.

Example user projects:

• ESA CCI and EC C3S Sea Surface Temperature, aerosol and cloud (Sentinel 3)

• Centre for Observation and Modelling of Earthquakes, Volcanoes and Tectonics (COMET) - Earthquake monitoring (Sentinel 1)

• Copernicus Global Land Service (CGLOPS) - Lakes (Sentinel 3)
CEDA Data

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Data Volume (Petabytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Observation</td>
<td>6.5</td>
</tr>
<tr>
<td>Atmospheric Science</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9 PB</strong></td>
</tr>
</tbody>
</table>

**EO data:**
- Sentinels 1, 2, 3, 5P
- MetOp (AVHRR, IASI, GOME-2)
- Envisat
- MODIS
- Landsat
- ESA CCI Data Archive
- …

Alongside climate and atmosphere data (meteorological, climate model simulations, reanalyses, aircraft and in situ observations)

- > 500 dataset collections
- ~ 180 million files
- > 50,000 registered users
~200 Science projects on JASMIN to date

Antarctic Ozone hole: model vs. observations

Sea Surface Temperature from satellite observations

Deriving the impact of fire on vegetation from earth observation data

Climate variables from European and US instruments/satellites
Virtual research environments on JASMIN

ESA Polar Thematic Exploitation Platform

Attendees at ESA Summer school, ESRIN used OPTIRAD Jupyter Notebook environment – Credit ESA

EOS Cloud – Desktop-as-a-Service for Environmental Genomics
CEMS Current Usage Statistics

46 live environments, with the amount of users, ranging from 1-250 per environment.

Resources in use:
- 245 VMs
- 1190Ghz CPU allocated
- 2.6TB RAM allocated

Main thematic areas of use:
- Agriculture
- Change detection
- Research & Development
- Ship tracking
- Modelling
- City planning
- Machine Learning

Key Projects:

UKSA IPPs:
- EASOS Malaysia
  - Illegal forestry
  - Flood prediction
  - Pollution (oil)
- Columbia
  - Illegal Gold mining
- Peru
  - Tailings dams
- Common Sensing
  - Disaster risk of Common Wealth small island states
  - G
- ESA DSI:
  - Reprocessing ESA mission data incl. Cryosat, Meris, ATSR, AATSR and Aeolus
SEDAS - CURRENT USAGE

670 registered users from 65+ countries

Example UK Based SEDAS users October – November 2018:

- Deimos Space UK
- CGG UK
- UKHO
- Environment Agency
- Earth-I
- CGI
- Digital Field
- ARUP
- Cotswolds District Council
- Tcarta
- Surrey Space Centre
- National Trust
- Telespazio Vega UK
- Oceanmind
- Open University
- Universities of Nottingham, Cambridge and Edinburgh
- Satellite Applications Catapult
UK Geospatial Commission

Announced December 2017 to maximise the value of all UK government data linked to location, and to create jobs and growth in a modern economy.

£80 million over two years will drive productive use of data unlocking up to £11 billion of extra value for the economy every year. The Commission is focusing on three key areas:

1. Grow geospatial sectors
2. Drive investment into geospatial technologies
3. Enhance geospatial data assets

Possible areas to look at in the near term include:

• Housing, land and planning;
• Infrastructure and construction
• Data quality and standards
• Earth observation
Update:

• geospatial Digital National Asset Register announced (29 October)
• A £5 million investment to its 6 Partner Bodies for data foundation projects.
• Geospatial call for evidence closed on 24 October.
  • 200 responses from central and local government, industry, academia and trade bodies.
  • Included 21 questions covering topics across the geospatial sector - from addressing to earth observation.
  • Extensive UK-wide engagement events, attended by 500 public and private sector organisations.
• The Commission is recruiting a Chair and Commissioners, building the Commission’s internal capability in the Cabinet Office, and hearing from a diverse group of organisations across the sector.
• It is a pivotal moment to help set UK’s future geospatial vision as the results are analysed and an annual plan launched in Spring 19.
EO Data what next

EODG:
- UKSA will continue to coordinate data related activities through the EO Data Group, maintaining close relationships with our industry and academic partners to inform our approach.

Data Programme:
- Conduct a full analysis of user requirements and the evolving complex nature of international data activities, in particular the evolution of the Copernicus Ground Segment, DIASs etc, rapid technological changes and business models
Thank you