A Roadmap for Earth Observation Education

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Frascati, 3-5 November 2014

Our vision for 2030

EO an integral part of Environmental Data Science (EDS)

- Practitioners use multiple data sources to create knowledge for decision support
- Data will be bio-geo-chemical, physical and social
  - Large data sets, from EO, models, in situ measurements, citizen science …
- Knowledge created through data analysis, statistics and models.
- Cloud computing important; extensive sharing of data, tools and information

Our vision for 2030

Wide-spread use of environmental data products in society

- More citizen scientists; more data journalists
- Environmental data products part of civil society and government advocacy
  - Policy makers use available EDS information and data products to give their decisions scientific credibility
- EDS practitioners have strong visualisation & communication skills
  - Trained to impart information to different audiences

So how do we get there from here?

Effective EO education for existing and future users of EO data

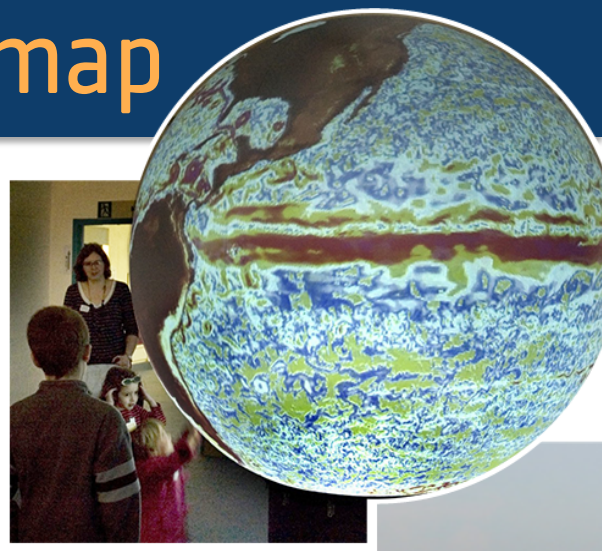
Aims for EO education 'audiences' considered in the roadmap

Attracting, inspiring and informing new audiences

- Schools – future EDS practitioners and decision makers
- Non-technical users in the wider community

Providing effective training for EDS practitioners

- Formal under- and post-graduate training
  - Future EO experts & data providers
  - Environmental scientists using EO as one of many tools
- Continuous professional development
  - Short training courses for specific audiences
  - Self study – on and off line



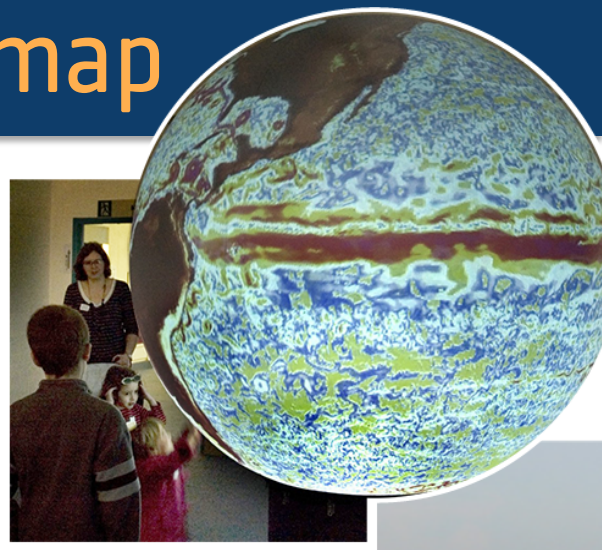
Aims for EO education 'audiences' considered in the roadmap

Supporting teachers, lecturers, course organisers

- Make it easier to find suitable resouces
- Helping to keep training up to date with new developments

Informing occasional users of EO data and services

- Governance and policy development
- Decision makers in industry and civil society
- Media and general public



Need to consider the needs of many different user groups

Schools – teachers and students

- EO can bring curriculum subjects to life and make them morel engaging
- Ensure curriculum links and allow teachers to search for using curriculum terms
- Provide activities and resource material suitable for self-directed student learning

Decision makers in government and civil society

- Easy access to EO data, case studies and technical information that are demonstrably relevant to an organisation or individuals remit and responsibilities

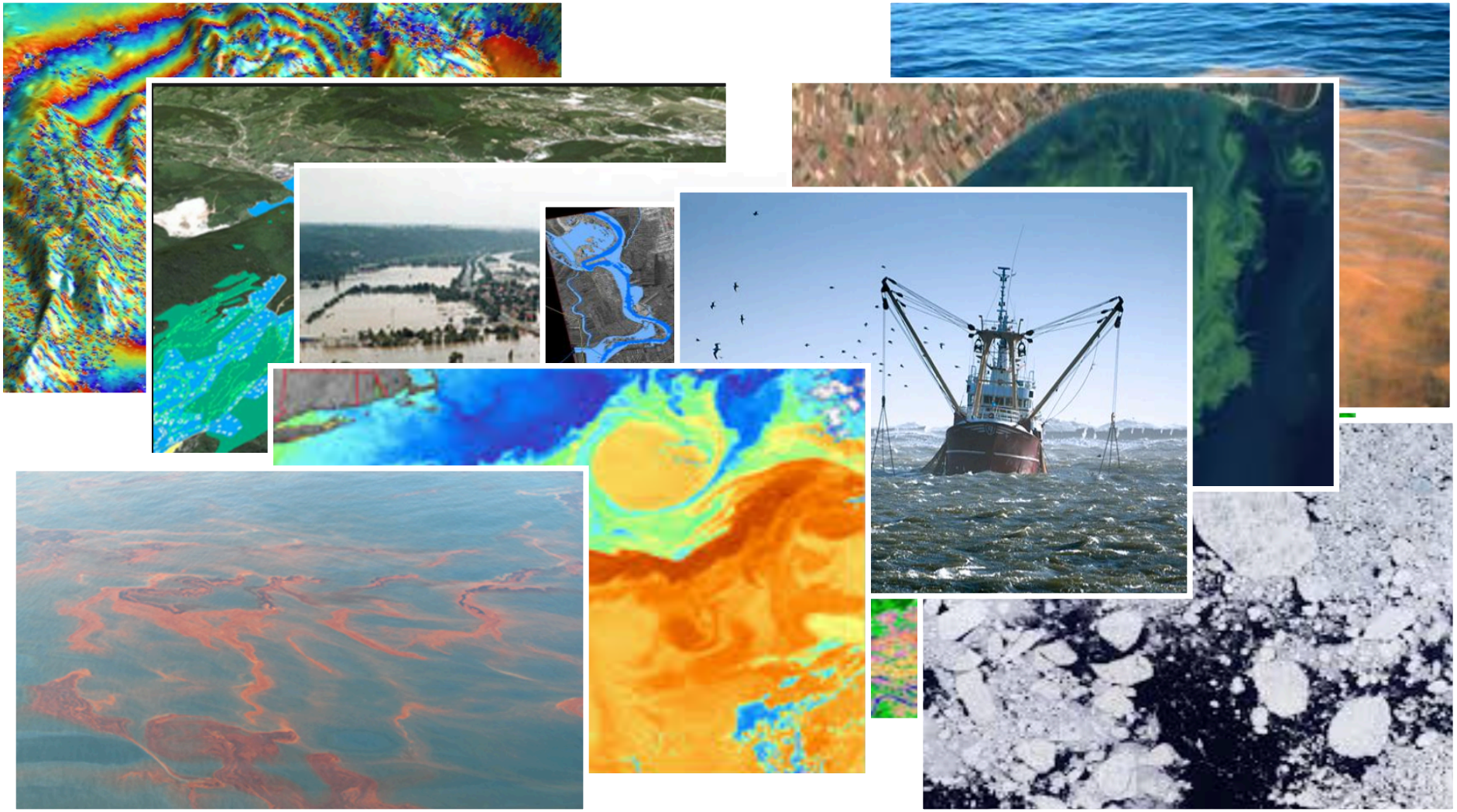
Formal training of future EDS practitioners

- Access to data and tools for developing analysis and interpretation skills
- Technical / environmental information for understanding EO strengths / limitations
- Visualisation / communication skills needed to provide effective decision support

Resource developers and course organisers

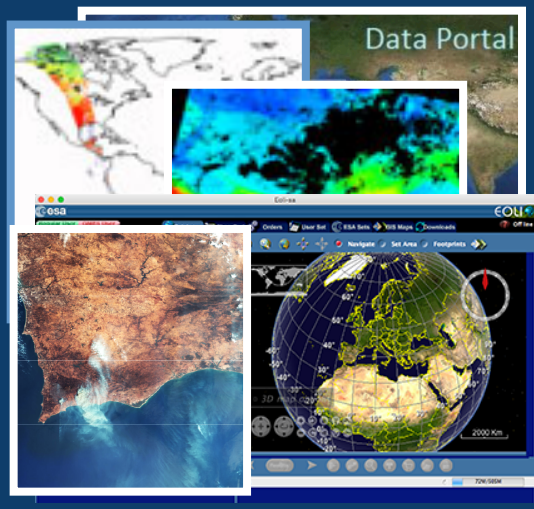
- Access to resources that can reduce the effort involved in providing training

.. a wide range of EO application areas and different geographical regions

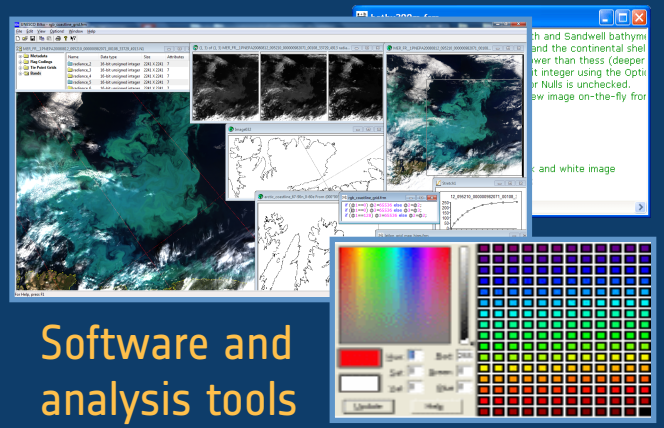


A myriad resources for a range of application areas tailored to different user groups

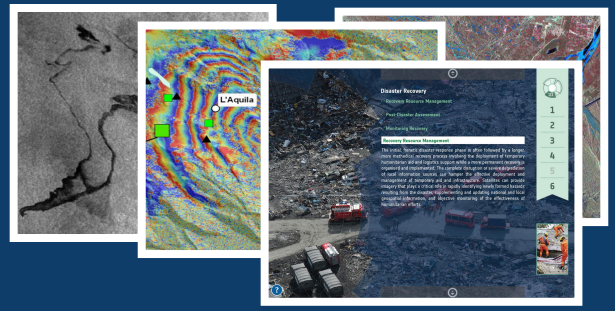
LearnEO!



Data portals & archives



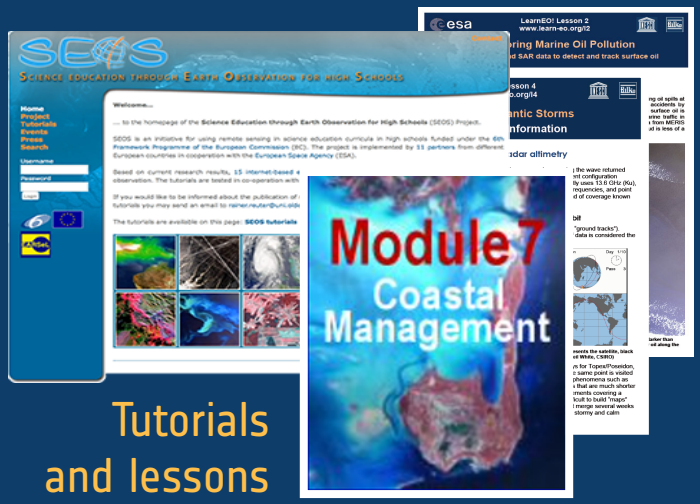
Software and analysis tools



Case studies, examples

Apps

Electronic books



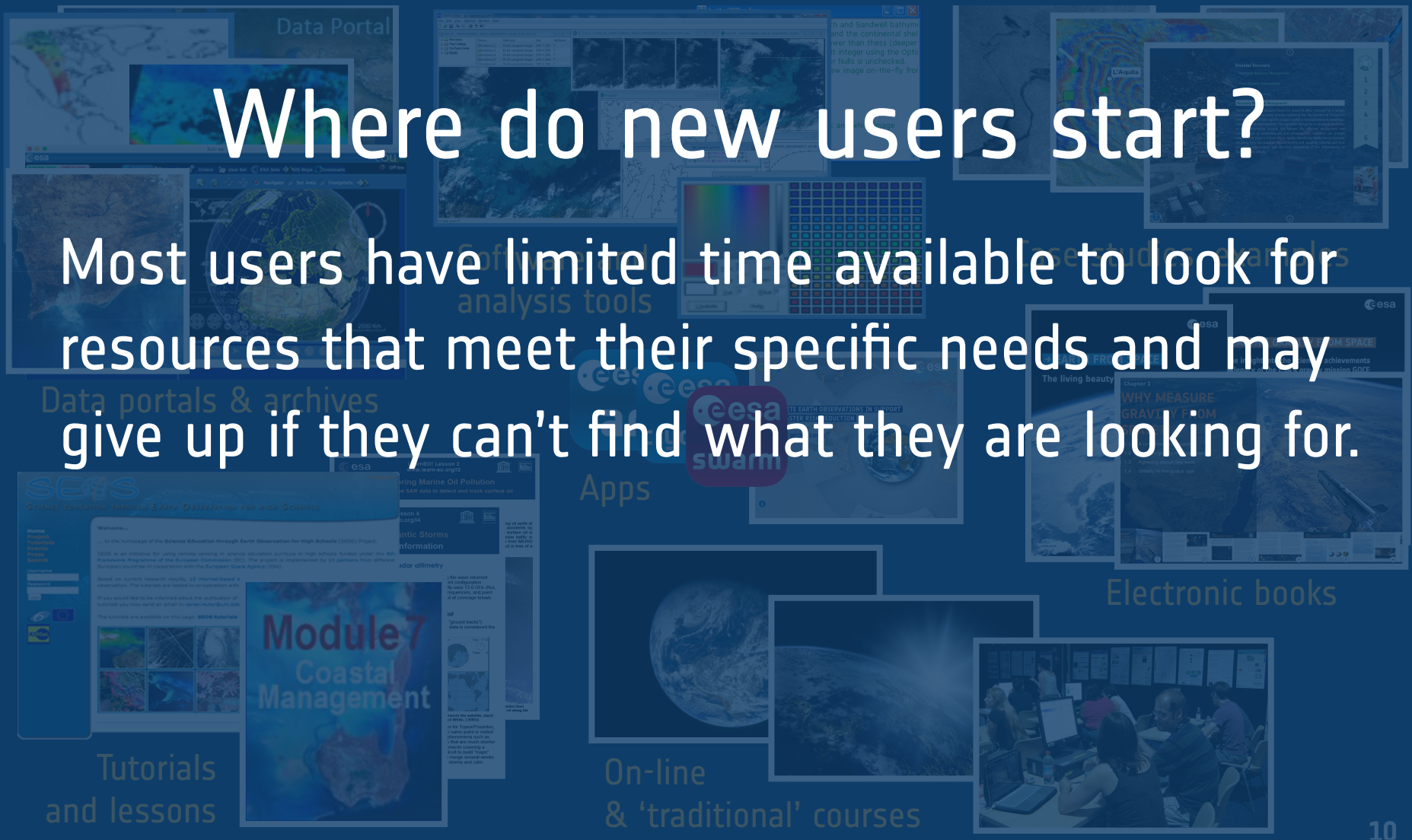
Tutorials and lessons

On-line & 'traditional' courses

Many more under development … showcased at EO Science 2.0

Where do new users start?

Most users have limited time available to look for resources that meet their specific needs and may give up if they can't find what they are looking for.



Barriers to effective EO education

Difficult to find data, tools & information suitable for non-experts

- Scientific users with limited EO experience need access to suitable data and tools
- Non-technical users in the wider community need relevant, intuitive case studies
- Schools need inspiring data and hands-on activities related to the curriculum

Barriers to effective EO education

Lack of clear, intuitive example data and case studies that:

- demonstrate the utility of EO-based information in different contexts
- cover a wide range of application areas and different geographical regions
- presented in contexts relevant to the intended target audience
- easy to interpret for users with limited EO experience

Barriers to effective EO education

Fragmentation of European EO education resources and initiatives

- First-time users meet a confusing variety of information, data types and tools, available on a variety of websites, portals, apps etc.
- Large number of short-term projects developed with limited international, European, national or local funding – often with little or no user support once the project is over
- Limited collaboration between longer-term sustained programmes

How can we overcome these barriers?

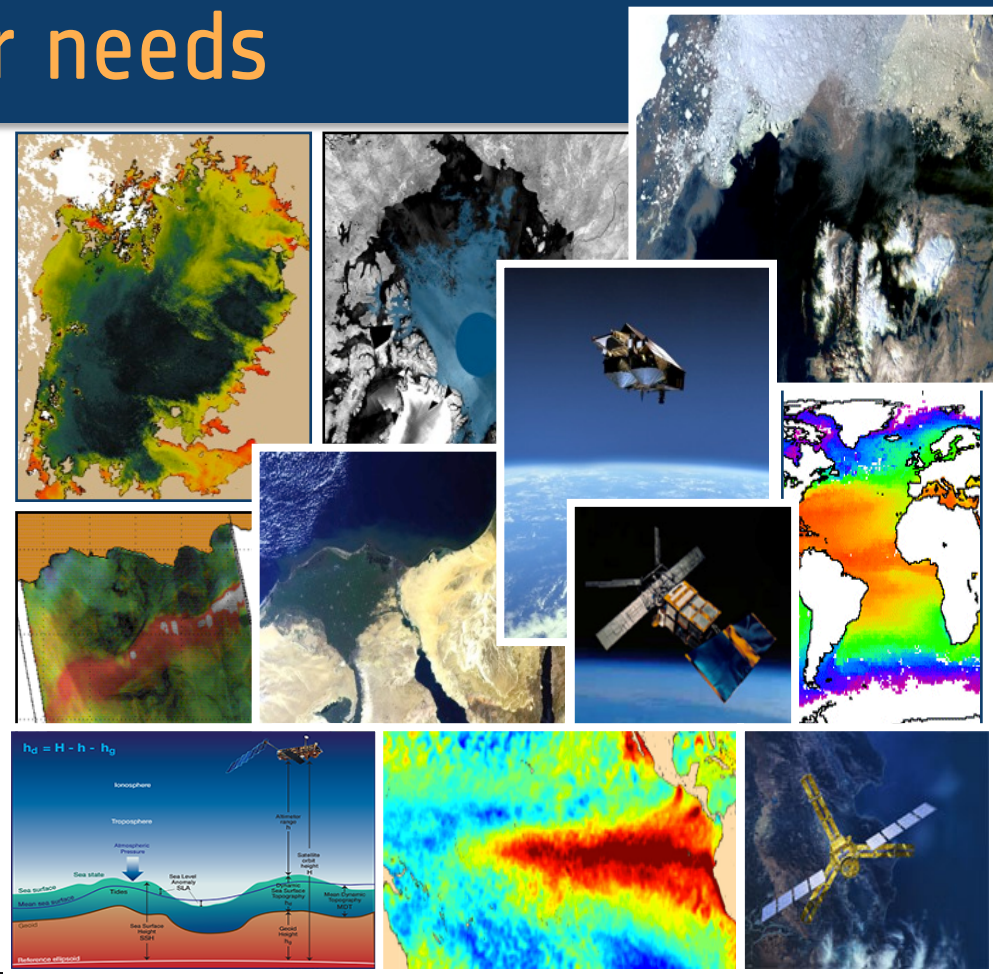
EO education market-place of resources tailored to user needs

Real data from many sources

- Access to EO archives, real-time data and higher level products
- Selected examples
  - Suitable and relevant to the target audience – important for beginners

Software & other tools

- Data analysis and visualisation
- Communication & dissemination



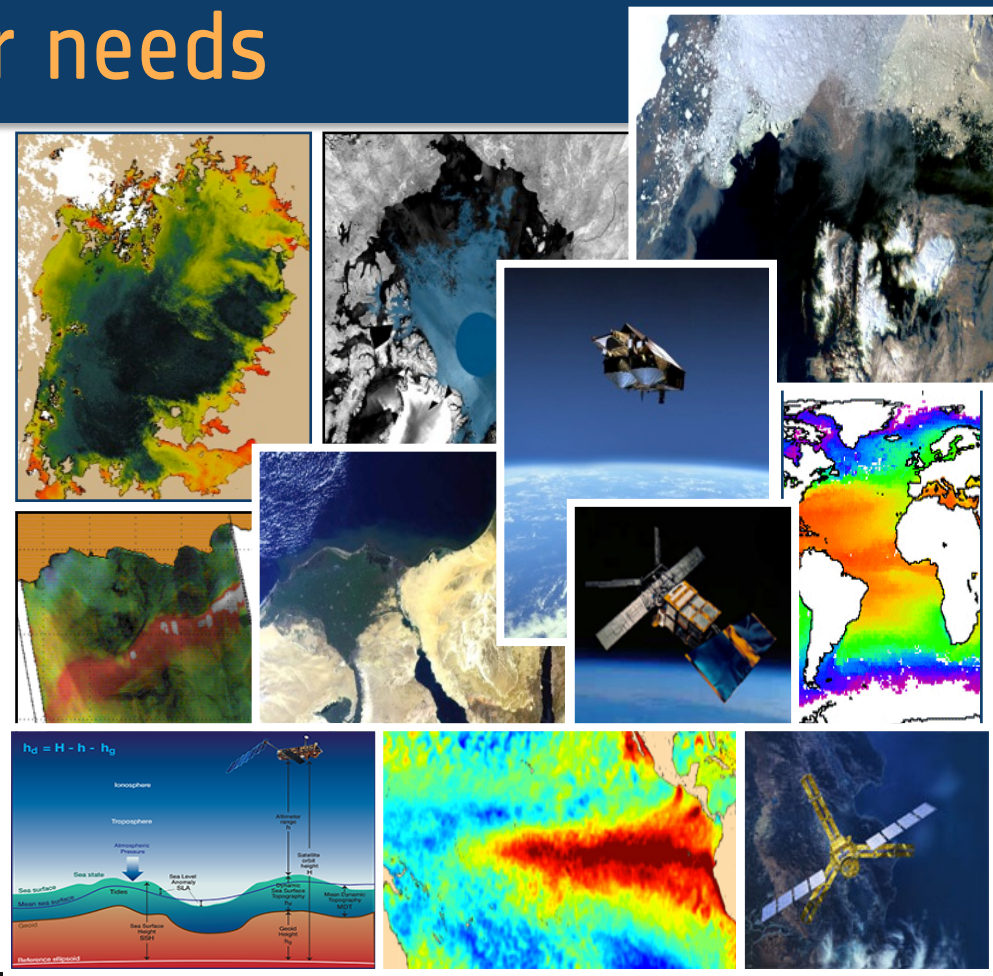
EO education market-place of resources tailored to user needs

Relevant background information

- EO technologies and applications
- Environmental / social background

Supported by hands-on activities

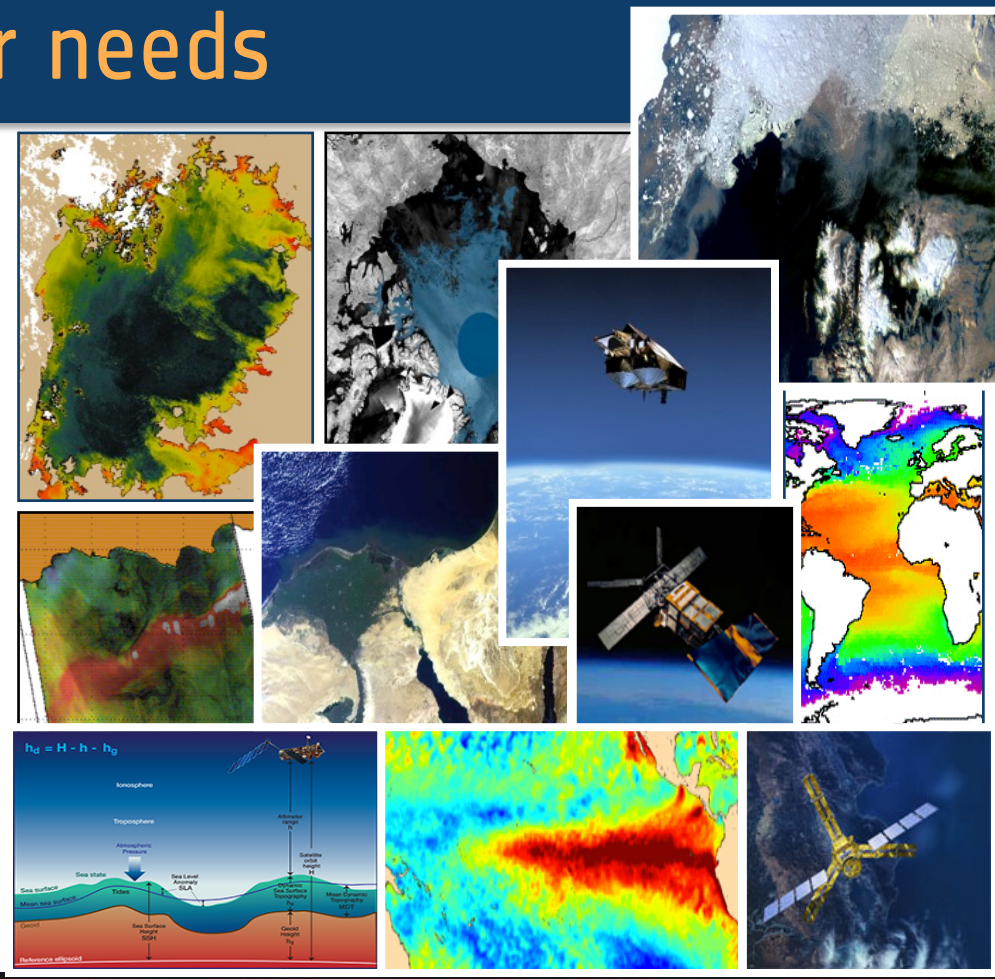
- to facilitate active learning of new skills



EO education market-place of resources tailored to user needs

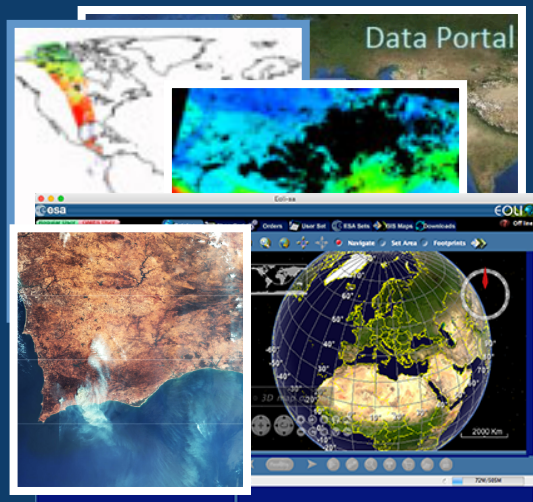
Used in on-line and off-line courses and training activities

- As part of citizen science projcets
- In MOOCs
- Professional development courses
- Formal education



LearnEO!

Review existing & new resources, map to user groups & identify gaps



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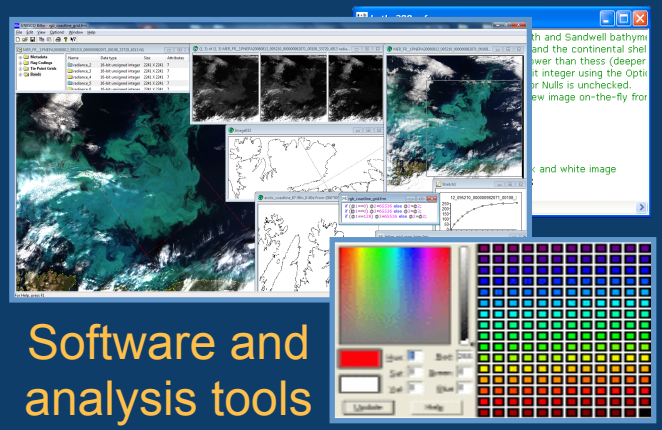
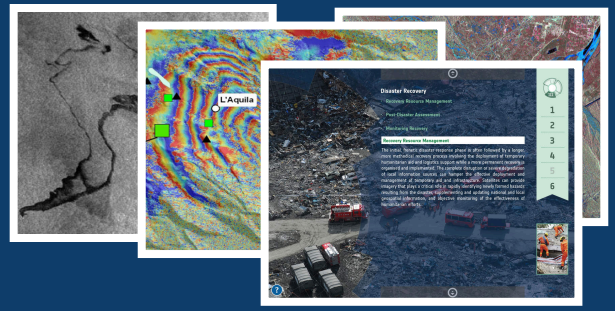


Software and analysis tools



Case studies, examples

Apps

Electronic books

Tutorials and lessons

On-line & 'traditional' courses

Making all EO education resources easy to find and access even for inexperienced users

Adaptive 'gate-way' tool giving one-stop access to a distributed EO education market-place where providers can exhibit their wares

- Adjusting to user profiles and preferences to select suitable resource
- Easy access to a wider range of resources delivered by many providers of data, tools, tutorials, background information and on-line / off-line courses
- Open to new contributors. Using 'Linked Data' principles?

Making all EO education resources easy to find and access even for inexperienced users

Recommendation 'engine'

- Users give feedback on resources and make recommendations to their peers
- User reviews are shared with resource developers and course organisers

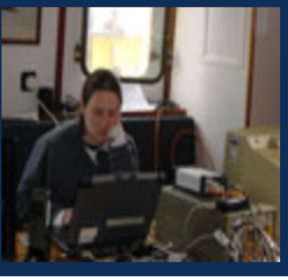
… and networking tools

Facilitate EO education networks

- Provide 'spaces' where users and resource providers in different application areas can share expertise and collaborate to develop, test, review, adapt, translate
- Facilitate collaboration between technical, environmental, social, educational & communications experts and representative of user groups
- Wiki's and fora where students, trainers and resource providers with common interests can come together to offer / receive advice and support
- Collaboration to create new on-line and off-line courses

Crowd-source new contributions to remain relevant and up-to-date



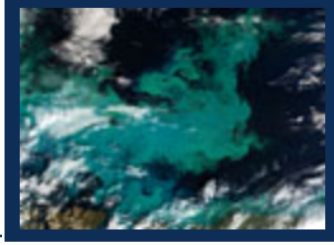



Support for new and existing contributors

- Offer easy access to existing material that may be adapted for use in new contexts
  - Example data and case studies, software tools and scripts, technical, background information, diagrams and figure.
- Provide guidelines for authors of self-study material
- Facilitate access to testing and review by experts and appropriate user groups







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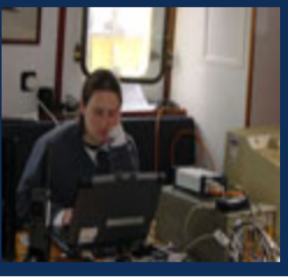
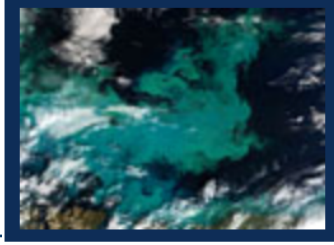


Crowd-sourcing' of new resources

- Encourage users to share their expertise and contribute data, tools and information based on their own work
- Ensure that contributors receive credit and recognition
- Facilitate partnerships between EO scientists, data-providers, professional educators and representatives of user groups







Exploit new technologies … but retain proven older methods

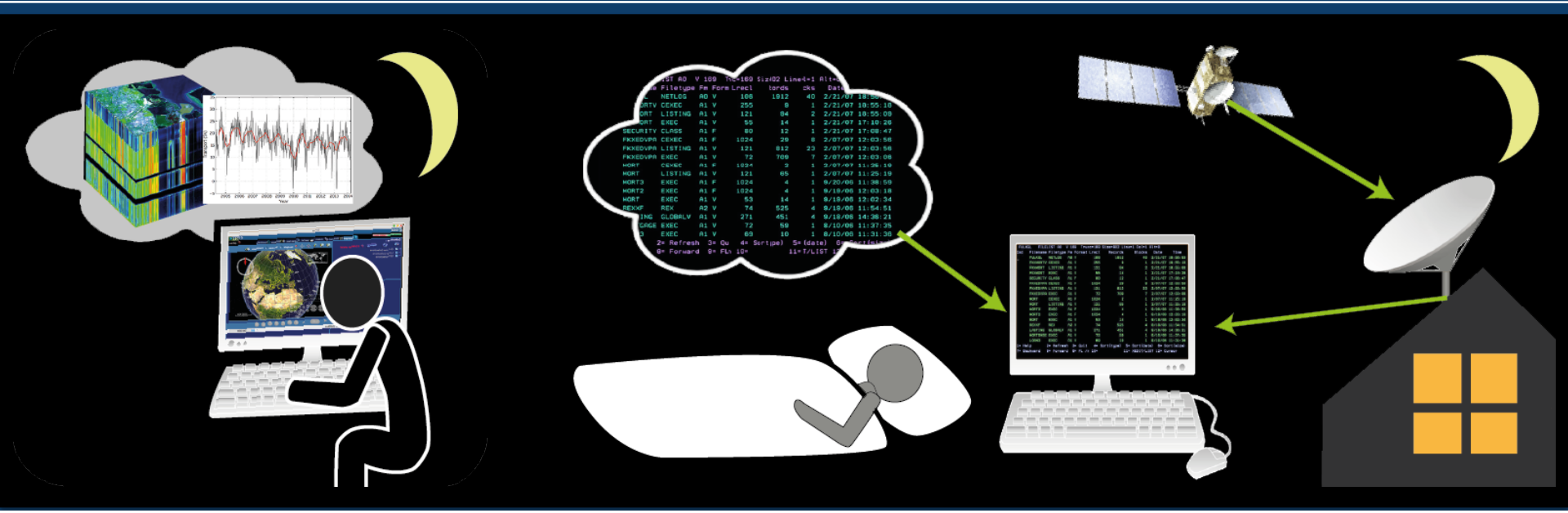
Take advantage of the web

- Cloud computing: using on-line tools to extract information from data archives
- MOOCs and other self-study courses
- Apps: data access, active learning, fun
- Interactive electronic books
- Training as part of citizen science

But try not to widen the digital divide

- Take care not to exclude educators and students with unreliable Internet connections

One reality when training future cloud-computing EDS practitioners



Key recommendations

- Review existing resources and identify gaps
- Adaptive gateway tools for easy access to EO ‘market’ linked to a ‘recommendation engine’
- Facilitate networks that link experts, resource providers and user groups for sharing, advice, testing & review
- Encourage users to share their expertise by contributing to the development of new resources

www.learn-eo.org/roadmap.pdf

Draft Roadmap for EO education

Comments and suggestions welcome

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by 15 November 2015