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University of Portsmouth

Application of low-cost geo-informatics for disaster risk assessments with focus on coastal regions

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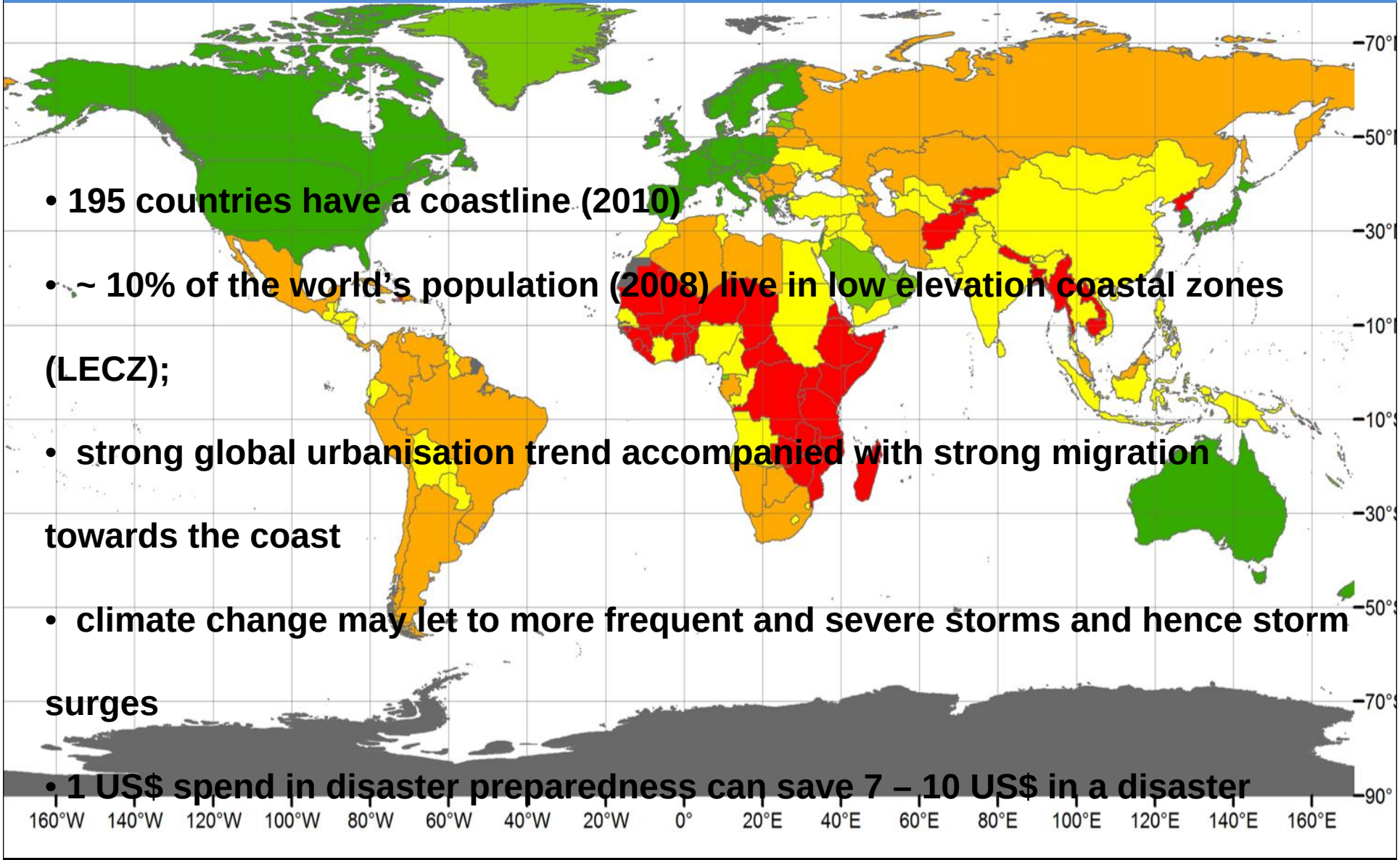
Outline

I. Background

II. Methodology & Preliminary results
- Workflow of this study
- Usage of virtual globes imagery

III. Concluding remarks

Quick Facts – motives for this research



- 195 countries have a coastline (2010)
- ~ 10% of the world's population (2008) live in low elevation coastal zones (LECZ);
- strong global urbanisation trend accompanied with strong migration towards the coast
- climate change may let to more frequent and severe storms and hence storm surges
- 1 US$ spend in disaster preparedness can save 7 – 10 US$ in a disaster

Main objectives & Low cost geo-informatics

Objectives:

• “translation” of methods and procedures to be used with Freeware and Open Source Software (FOSS)

• incorporation of virtual globe imaginary as high resolution data alternatives in DRR and mapping tasks

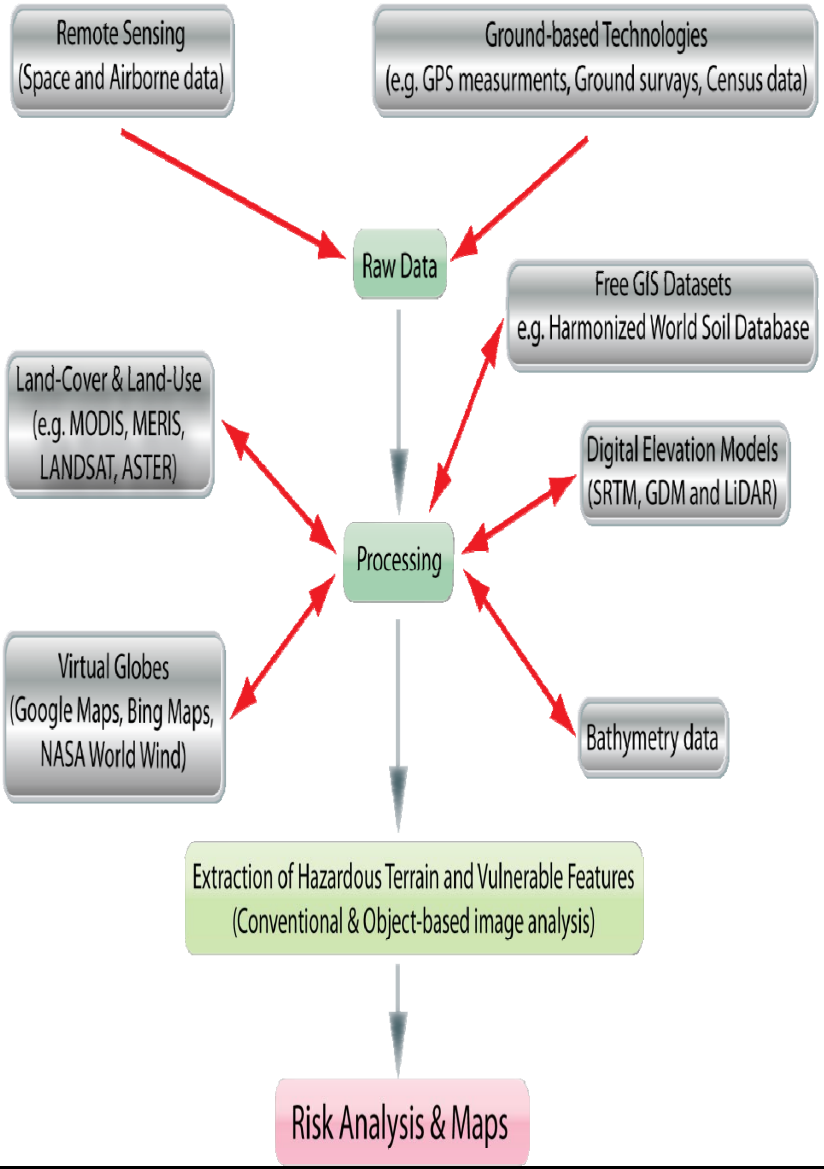
• assessment how object based image analysis (OBIA) software (based on FOSS) can be incorporated for

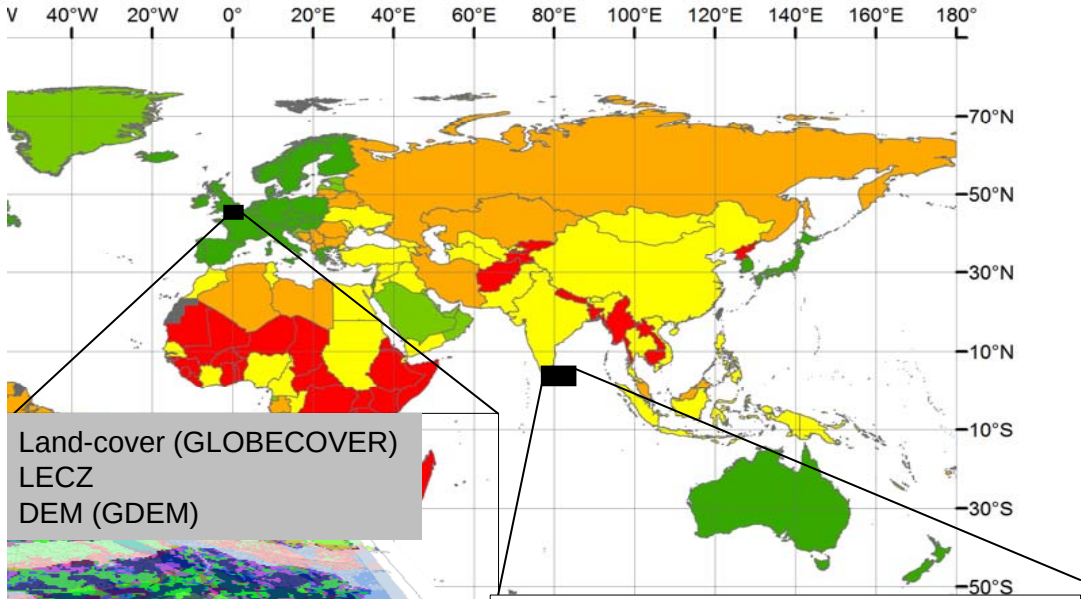
operational use in DRR for coastal regions

Low-cost geo-informatics:

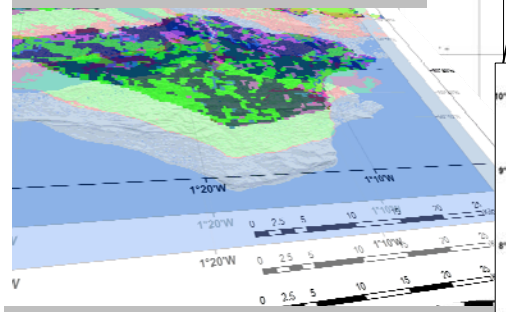
• Economically reasonable (no license fees, software usually downloadable from Internet)

Workflow & Training sites

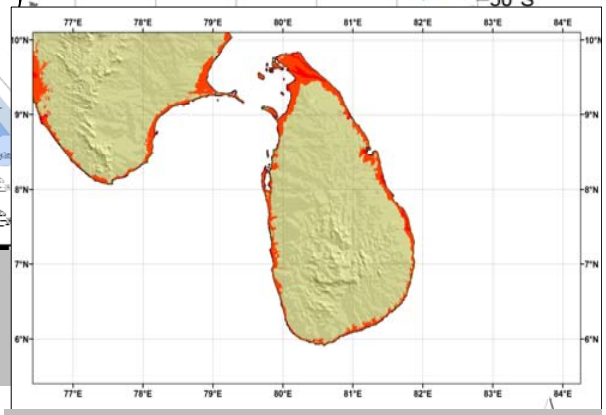




Land-cover (GLOBECOVER)
LECZ
DEM (GDEM)

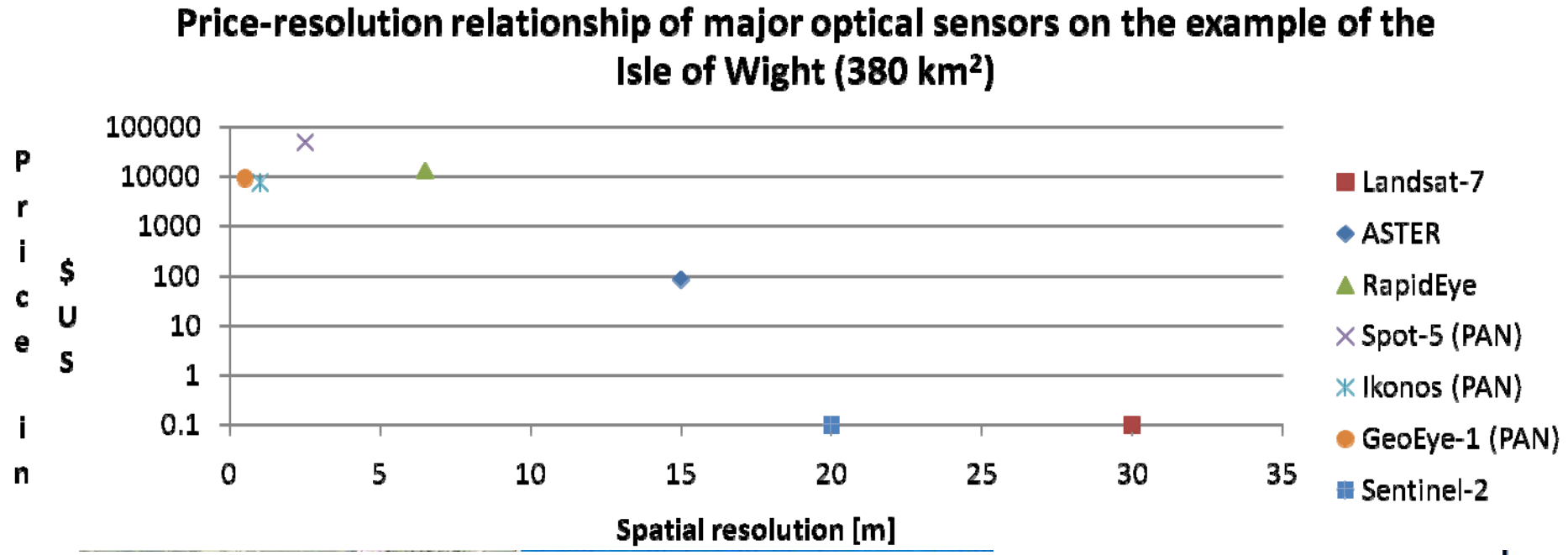


Training site Isle of Wight (UK)
Example for a High Income Country



Training site Sri Lanka
Example for a Lower Income Country

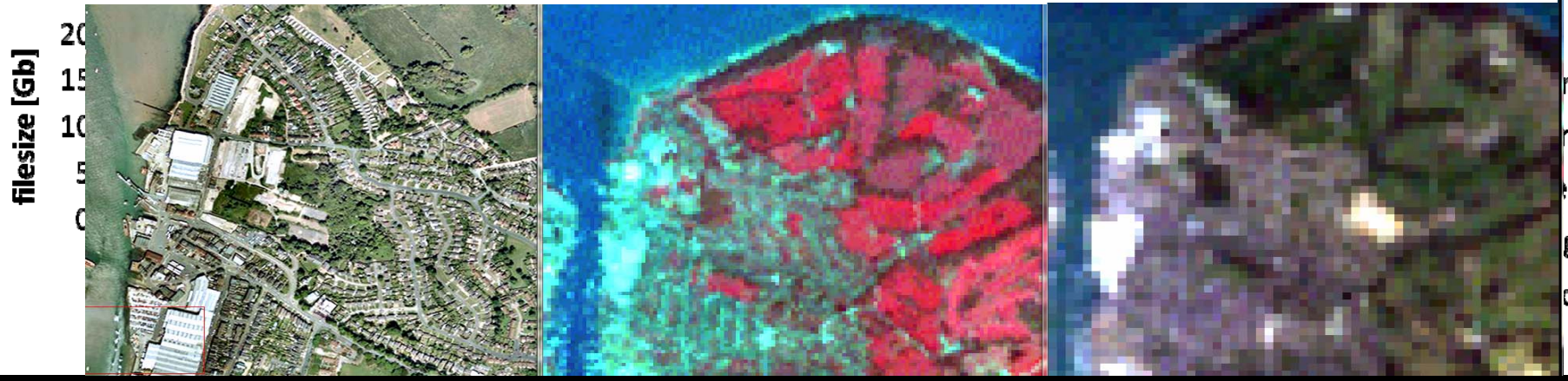
Data costs & Performance of FOSS vs. commercial software



BINGMAP, Screenshot, georeferenced, resolution:~1.51m, free

ASTER, RGB (bands 3N21), resolution: 15m, ~ 80US$

LANDSAT-7, RGB (bands 321), resolution:~30m, free

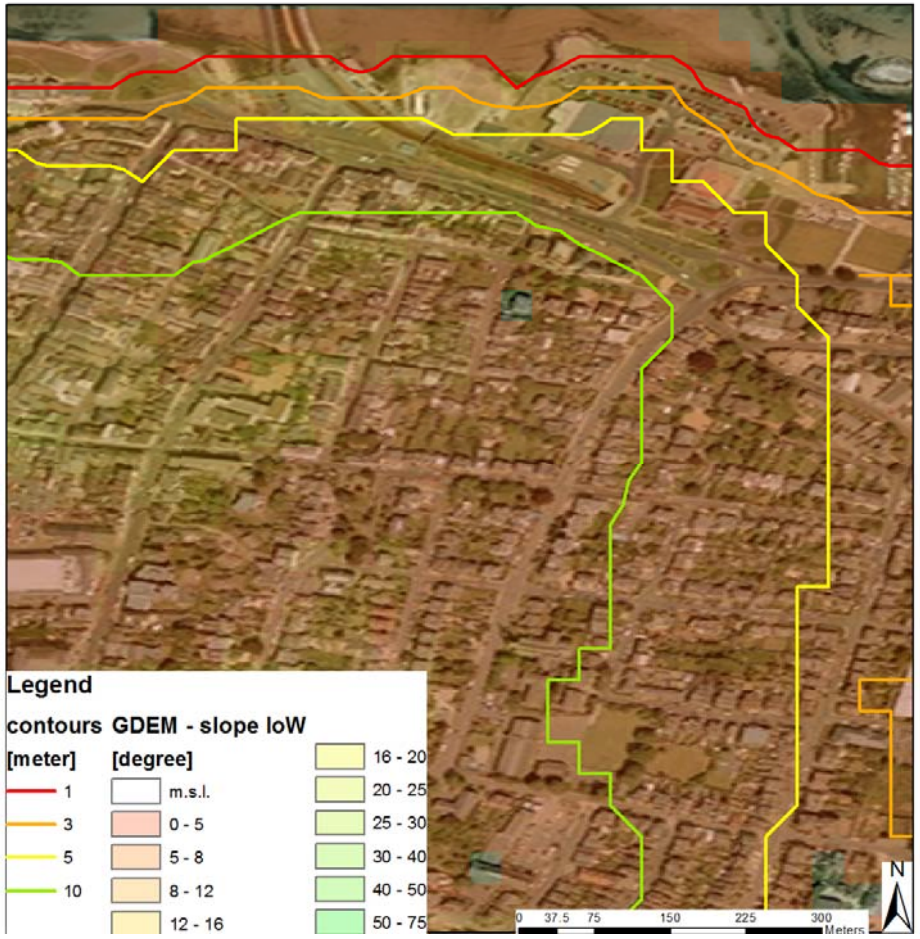


Usage of virtual globes

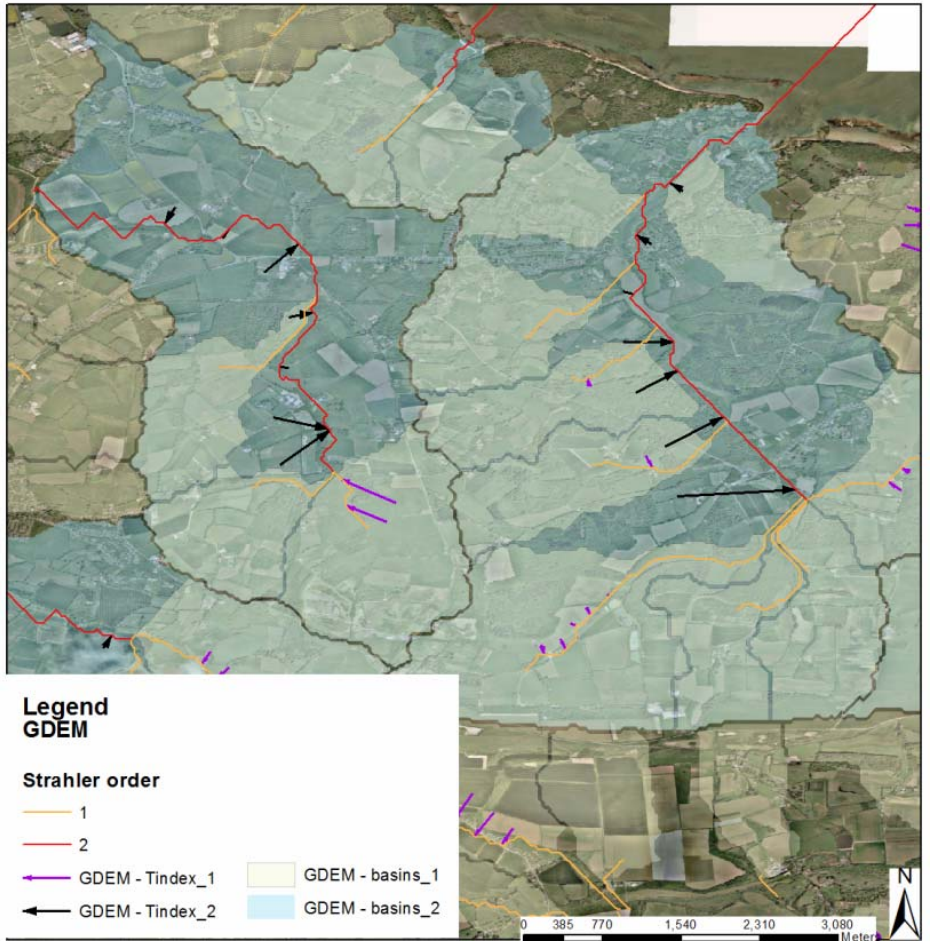
Georeferencing BingMaps mosaic ("Zoom level 5“) using QGIS (v. 1.6)

method/input	Landsat-7 (# GCP: 54)	GoogleMaps (# GCP: 97)	DigiMap (1:1000) (# GCP: 802)
projective	N/A	N/A	1.511 m
thin plate spline	N/A	N/A	1.507 m
polynomial -1	1.515 m	2.200 m	1.511 m
polynomial -2	1.514 m	2,198 m	1.511 m

Combining and Presenting Information



Accuracy assessment: pending; optical good match with real world occurrences (e.g. Coastal flooding of the Isle of Wight)



Example of a TecDEM (free Toolbox for MatLab) output indicating the incorporation of geomorphic parameters

Current work & Outlook – Object based image analysis (OBIA)

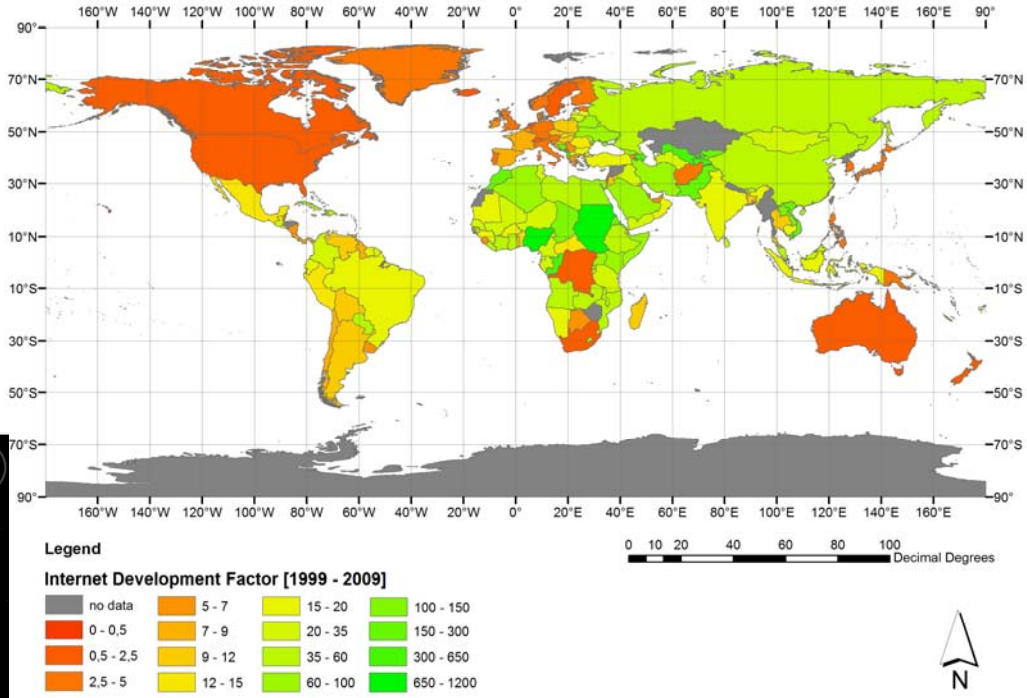
Image segmentation and classification using InterImage: examples for Virtual Globe imagery but FOSS works also on ASTER, SPOT, LANDSAT etc.

Main challenge for OBIA on virtual globe imagery:

- missing spectral information
- little to nothing published on segmention settings (trial and error for different resolutions)
- accuracy assessment (general challenge for OBIA)

How to distribute results?

Googles kml abilities are more and more used to share and/or present data.
The huge advantage is that even large and complex data sets can be easily distributed and opened even with low Internet connection.



The next months...

o (finishing) comparison of predictive risk maps with real world events to assess effectiveness (via accuracy/veracity and also by cost-effectiveness (time involved, software costs, data costs)) on examples such as:

- the coastal flooding of the Isle of Wight
- the 2004 Indian Ocean Tsunami (trainings sites in Sri Lanka)

o optimisation and continuation of the application of OBIA for DRR

o comparison of OBIA FOSS to their commercial counterparts (eCognition, ENVI packages etc)

Concluding remarks

- application of FOSS is suitable for a lot of the requirements and requests of NGOs, especially for visualisation during disaster events (e.g. QGIS meanwhile in operational use by MapAction)
- FOSS and low cost-approaches are more than feasible for training and capacity building purposes (e.g. internal/external training by MapAction and RGS)
- Interest expressed by members of various NGOs, but also BGS (UK), GIZ (DE), insurance companies

- Awareness raising could be enhanced if organisations, NGOs etc would not directly request e.g. “ArcGIS experience” but “GIS experience” or “ArcGIS and alternatives” in job and internship announcements -> more freedom for universities to incorporate FOSS in teaching

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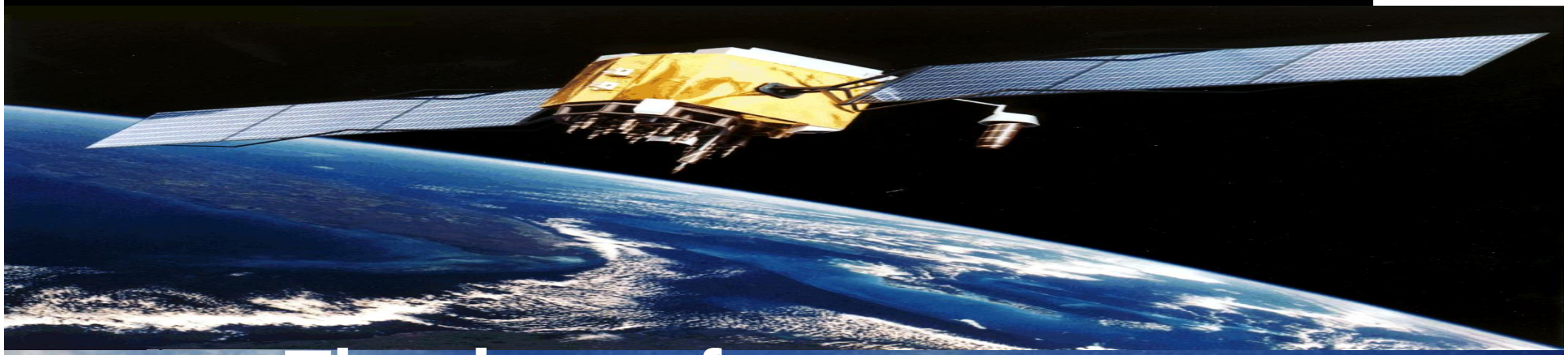

Thank you for your attention!

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• NASA through providing ASTER data
• ESA/CNES by providing SPOT-5 imagery of various resolution and
• ITT (UK) by providing their OBIA package for ENVI for 1 month