MARIE CURIE ACTIONS

Marie Curie Series of Events METIER

„METhods of Interdisciplinary Environmental Research“

Course 1: „Remote Sensing of the Atmosphere“
Course 2: „Information Management“
Course 3: „Remote Sensing of the Land Surface“
Course 4: „Geo-visualization“
Course 5: „Ecological Modelling“
Course 6: „Remote Sensing of the Hydrosphere“
Course 7: „Scenario development and forecasting“
Final conference: „Science meets Society“

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METIER course 6: Remote Sensing of the Hydrosphere, Helsinki, Finnish Environment Institute 3rd - 7th November, 2008

	Monday, 3rd Nov	Tuesday, 4rd Nov	Wednesday, 5rd Nov	Thursday, 6rd Nov	Friday, 7rd Nov
Theme of day	Remote sensing, general & data handling	Water quality	Hydrological & nutrient leaching modelling	The value of GIS data for society	Assimilation of remote sensing and environmental models
9:00-10:00	Welcome, practical information, aims of the course, **Juha Kämäri, Sirkka Tattari**	**General lecture II**: Remote sensing, GIS and water quality, **Steef Peters**	**Lecture**: An operational large scale hydrological model, **Bertel Vehviläinen**	**General lecture IV**: The use of model, GIS and remote sensed data in the society - examples from urban planning, land use and flood management, **Dagmar Haase**	**General lecture V**: Theory of data assimilation and inversion, **Jouni Pulliainen**
10:00 - 10:30	Student poster session/oral presentation		**Lecture**: Assimilation of satellite based snow, soil moisture and flood area information into large-scale hydrological models, **Sari Metsämäki & Markus Huttunen**		
10:30 - 10:50	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
10:50 - 11:45	Student poster session/oral presentation	**Lecture, case study**: Remote sensing of water quality: The development and use of water processors available in BEAM, **Sampsa Koponen**	Student feedback, how they can utilize GIS data and modelling in their own work?	**Lecture, case study**: The Use of Remote Sensing, Drifting Forecasts and GIS Data in Oil Response and Pollution Monitoring, **Kati Tahvonen**	Summary; Practical info, Feedback Form
11:45 - 13:00	Lunch	Lunch	Lunch	Lunch & coffee	Lunch
13:00 - 15:00, one break in-between	**General lecture I**: Remote sensing of soil moisture and related use of remote sensing data as input to hydrological and meteorological, models/assimilation, **Wolfgang Wagner**	**Lecture, case study**: New measurement technology, modelling and remote sensing in the lake Säkylä Pyhäjärvi area, **Timo Huttula**	**General lecture III**: How GIS and remote sensed data is used in nutrient leaching models – state of art and visions for future, **Andrew Wade**	Laboratory visit, Helsinki University of Technology, Laboratory of Space Technology, **Host: Jaan Praks, Otakaari 5 A C220**	Transportation to the airport
15:00-15:30	Coffee break	Coffee break	Coffee break		
15:30 - 17:00...17:30	**Lectures**: GIS databases and spatial data infrastructure in SYKE, **Minna Kallio,** EO operational data provision for modeling purposes**, Timo Pyhälahti,** Discussion	**Discussion & Hands-on training** - Image Processing using Erdas tools, **Timo Ikola, T-Kartan Product AB**	**Discussion & Hands-on training**: Operational large scale hydrological and water quality model, **Markus Huttunen**		

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Need for Global Soil Moisture Observations

Socioeconomic Perspective (*Nature* from April 2008)

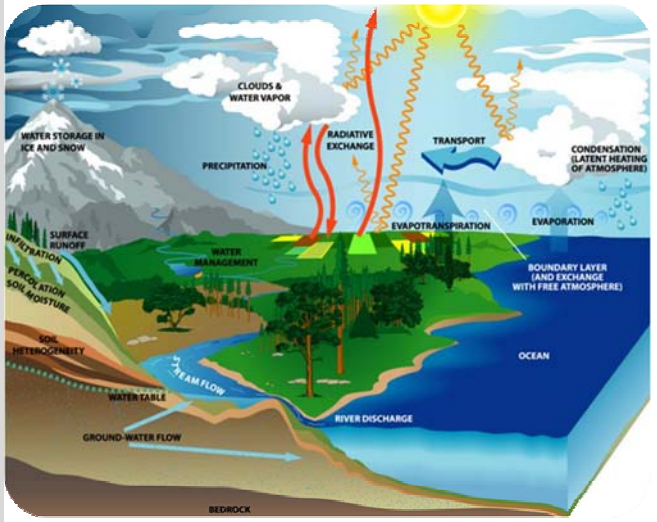
- Population growth, economic development and climate change put high pressures on water resources
- Current models suggest that more rain will fall, but less often
- Crisis from health sector will soon spill over to the energy and agricultural sectors

Model Perspective

- Model physics at large scale are often not well understood
- Do we correctly model infiltration, evapotranspiration, etc.?

Data Perspective

- Lack and limited representativeness of in-situ soil moisture data
- Hydrologic soil properties not properly described by soil maps



Reference: General lecture 1– Wolfgang Wagner, Vienna University of Technology "Remote Sensing of Soil Moisture in Support to Hydrological and Meteorological Modelling"

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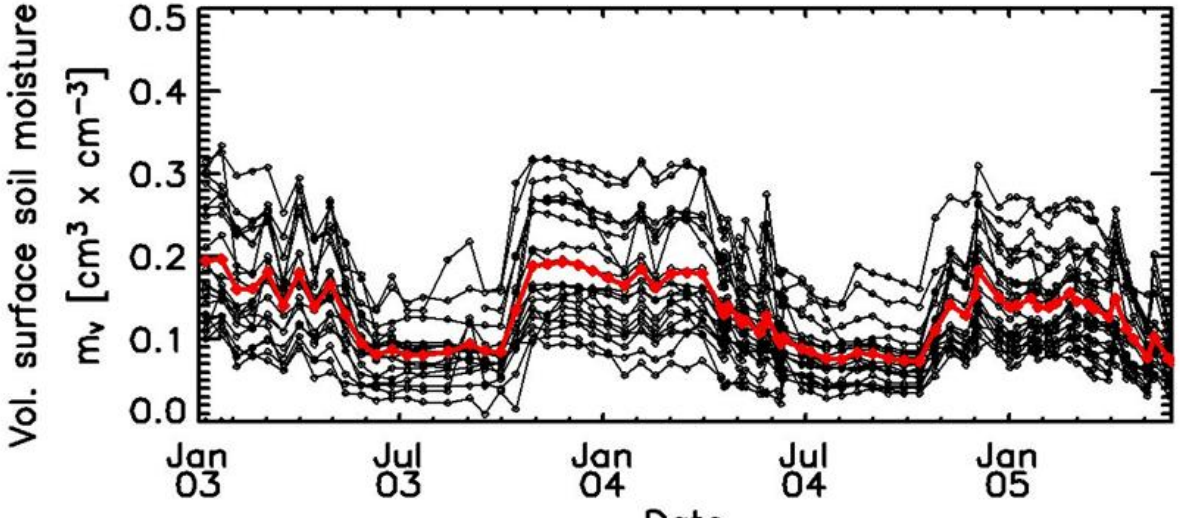
Soil moisture: future research topics

- Important research topics
  - Advance our understanding of algorithms and their errors
  - Establish a global soil moisture network
  - Create multi-mission data sets for climate studies
  - Adapt models for use of remote sensing data
  - Advance data assimilation techniques

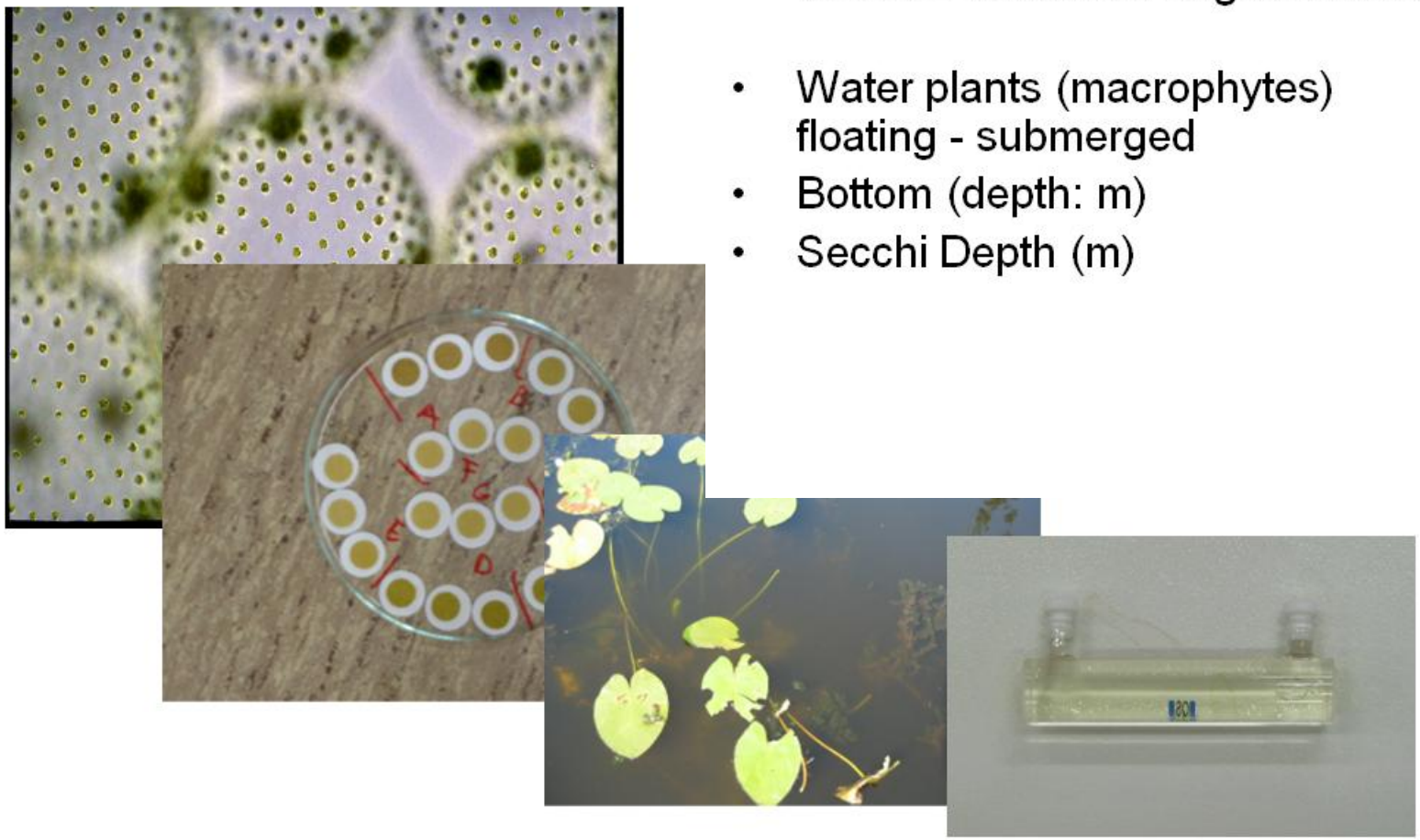


Mean (red) and station (black) in-situ soil moisture time series. REMEDHUS network in Spain.
© University of Salamanca

Reference - General Lecture 2: Steef Peters, Institute for Environmental Studies (IVM), Vrije Universiteit, Amsterdam : “Remote Sensing, Water quality and GIS

Optical active water quality parameters

- Chlorophyll Pigments (mg/m3) CHL
- Total Suspended Matter (g/m3) TSM
- Inorganic fraction of TSM (g/m3) ISM
- Colored Dissolved Organic Matter CDOM
- Water plants (macrophytes) floating - submerged
- Bottom (depth: m)
- Secchi Depth (m) SD



Concluding remarks

- Remote sensing of water quality is still under development
- Operational products are available for most European waters
- There are many uncertainties in the process
- A thorough insight in the variability of SIOPs is required
- An insight in the effect of inaccuracies in the observed spectra is required

Further reading

www.ioccg.org

And e.g.:

Ian S. Robinson, David Antoine, Miroslaw Darecki, Patrick Gorringe, Lasse Pettersson, Kevin Ruddick, Rosalia Santoleri, Herbert Siegel, Patrick Vincent, Marcel R. Wernand, Guy Westbrook, Giuseppe Zibordi (2008) Remote Sensing of Shelf Sea Ecosystems, State of the Art and Perspectives, ESF Marine Board Position Paper 12.

Specific Inherent Optical Properties =SIOP

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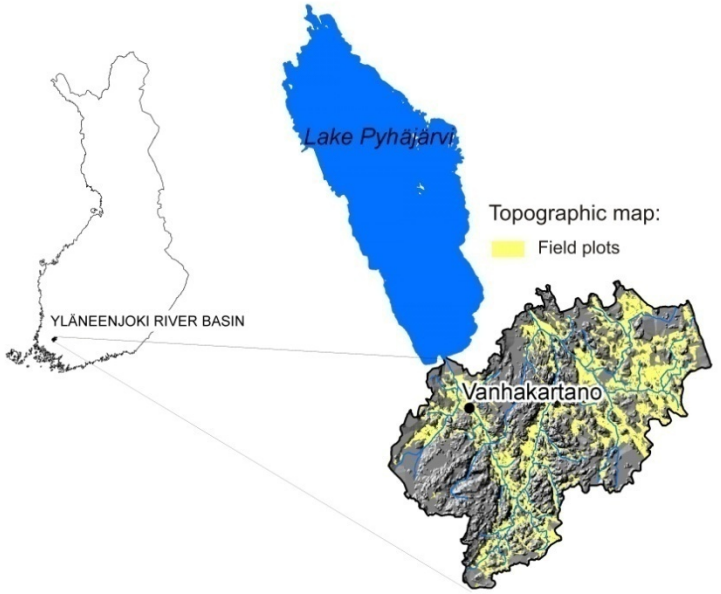
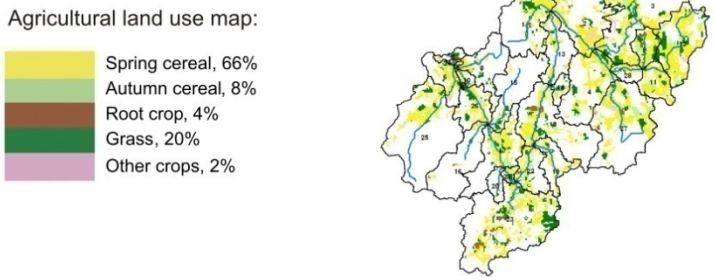
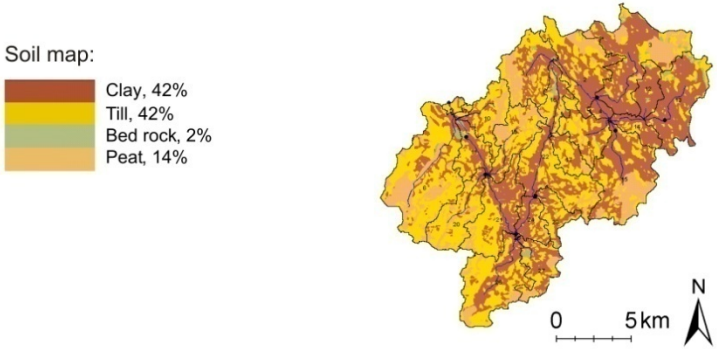
Integrated catchment nutrient models

Opportunities from remotely sensed data in a GIS framework

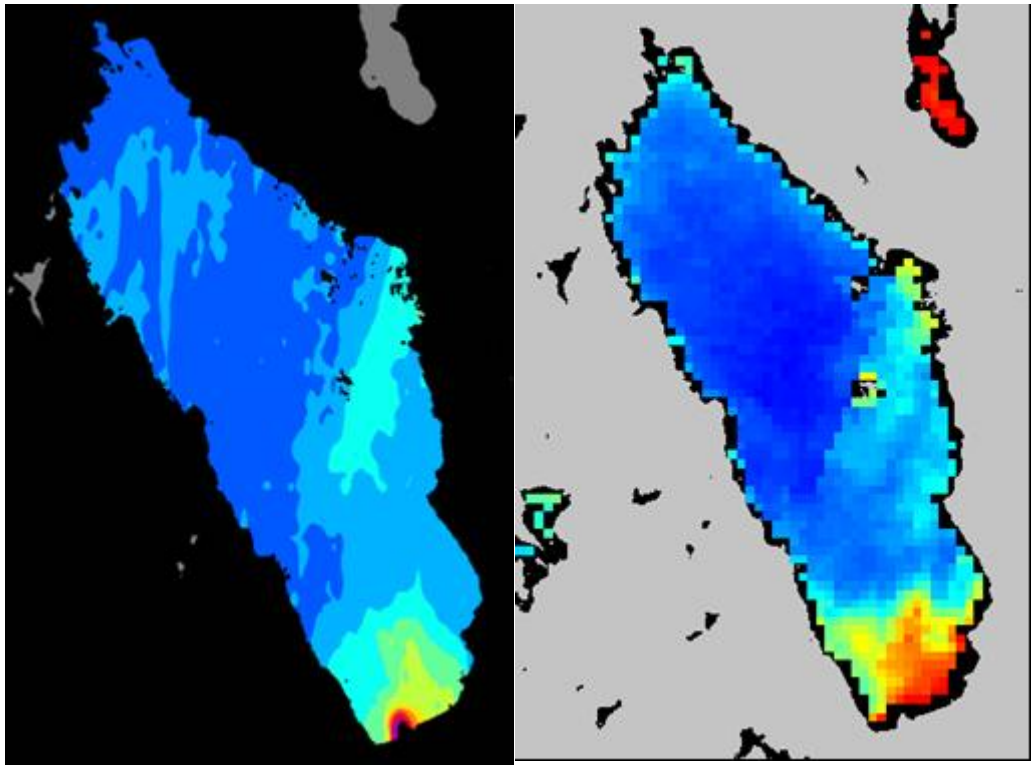
- Land cover
- Digital elevation data
- Soil moisture
- High frequency chemistry







Reference - General Lecture 3: Andrew Wade, University of Reading UK : Modelling, GIS and remote sensing & Timo Huttula, Sirkka Tattari, Finnish Environment Institute



(a) Turbidity interpolated from transect data, and (b) MERIS reflectances at 708 nm on 9.5.2006.

High frequency data Where will it lead us?

- Better load estimates

Better understanding of diurnal cycles

Biology

Evaporation

Catchment functioning; timing of inputs

Better model calibration or model rejection

New models

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The value of GIS data for society, 1 example:
Using the history for shaping the future

- Historical maps can be integrated into a GIS to model/show land use change quantitatively over >200 years.

- Statistics can then be compiled on the development of the proportions of linear elements and areas of certain usage types.

- Taking into account landscape functions in the assessment brings home how important it is to consider the 'loss' of not only land in the meaning of total area but also resources.

- Quantification of long-term land use change and its environmental impact enables us to reduce the existing uncertainty to predict future landscape change

Reference - General Lecture 4: Dagmar Haase, Department of Computational Landscape Ecology, UFZ: The use of model, GIS and remote sensed data in the society

Remote Sensing in Hydrology 2010 Symposium

27–30 September 2010
Snow King Resort, Jackson Hole, Wyoming

Abstracts due: 26 March 2010
For information and abstract submittal go to:
http://www.remotesensinghydrology.org/

Planned session themes:

- Remote Sensing of: Precipitation; Evapotranspiration; Soil Moisture and Groundwater;
- Snow and Ice; Wetlands and Riparian Zones
- Hydrological Modeling and Forecasting using Remote Sensing Data
- Operational Hydrological Applications of Remote Sensing Data
- The Role and Importance of Large-Scale Experiments in Hydrological Understanding
- New Airborne and Satellite Sensors for Hydrological Monitoring and Modeling
- Passive Microwave and Radar Applications in Hydrology
- Remote Sensing and Un-gauged Basins
- Evapotranspiration of Agricultural Crops and Irrigation Water Demand
- Watershed Land Cover and Estimation of Model Parameter Inputs
- Energy Balance Estimations

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