Workshop Objectives

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workshop on
HYDROLOGY FROM SPACE
cnes
LEGOS
OBJECTIVES
ORGANISATION
COMMITTEES
CONTACTS
GENERAL INFORMATION
PROGRAM
REGISTRATION FEE
29 Sept. - 1 Oct. 2003, Toulouse, France

EOS

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

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MEETINGS

Space Techniques Used to Measure Change in Terrestrial Waters

—A. CAZENAVE, LEGOS-CNES, Toulouse, France; P. C. D. MILLY, U.S. Geological Survey, Princeton, N.J.; H. DOUVILLE, Centre National de Recherches Meteorologiques (CNRM), Toulouse, France; J. BENVENISTE, ESA/ERSIN, Frascati, Italy; P. KOSUTH, Cemagref, Montpellier, France; and D. LETTENMAIER, University of Washington, Seattle

LEGOS
Toulouse, France

March 16, 2005

Summary of Discussions for the Surface Water Satellite Mission workshop, held March 7-8, 2004 at ESRIN, Frascati, Italy.

Meeting attendees: Doug Alsdorf, Paul Bates, Jérôme Benveniste, Philippa Berry, Alex Braun, Stéphane Calmant, Anny Cazenave, Jean-François Crétaux, Dianne Defrenne, Remco Dost, Nick van de Giesen, Einar-Arne Herland, Pascal Kosuth, Bruno Lazard, Marco Mancini, Yves Ménard, Nelly Mognard, Stefan Niemayer, Ernesto Rodriguez, Ake Rosenquist, C.K. Shum, Larry Smith, Wim Timmermans, Matthew Wilson

The aim of this workshop was for the European/International scientific community with an expertise in hydrology, hydrodynamics, and remote sensing techniques to discuss and structure the writing of a proposal for the forthcoming ESA Earth Explorer Core Mission Announcement of Opportunity (AO). This workshop is the 3rd European workshop with a focus on Space Hydrology and follows the Toulouse meeting held last November where the science and technology issues of a surface water satellite mission were discussed (see summary of discussions sent last December).

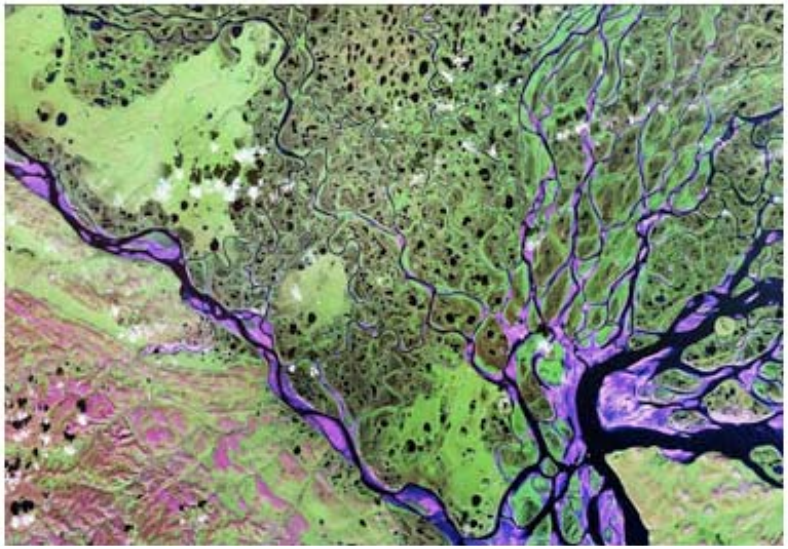
WatER Mission

Responsable Edition : Nelly Mognard-Campbell *Webmaster : Véronique Barbe*

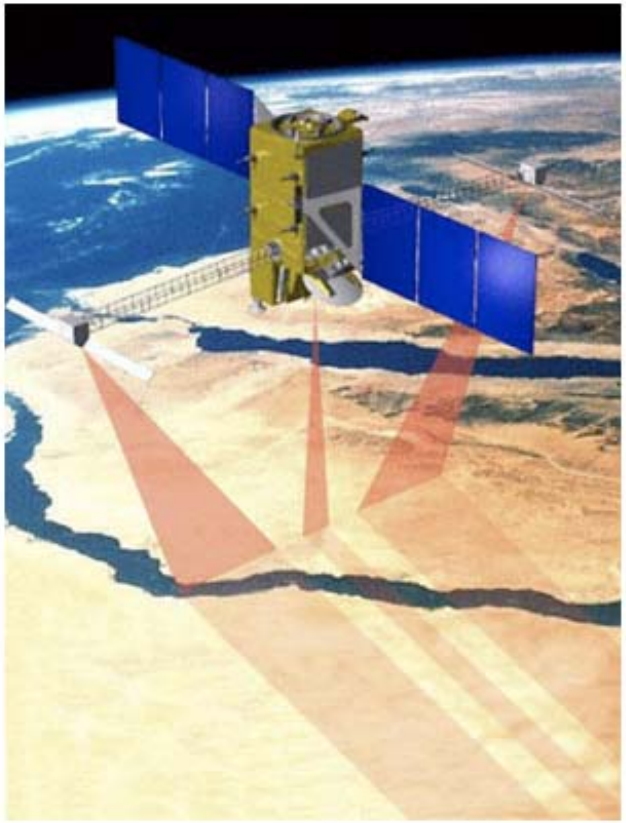
Welcome to the European WatER Mission web site

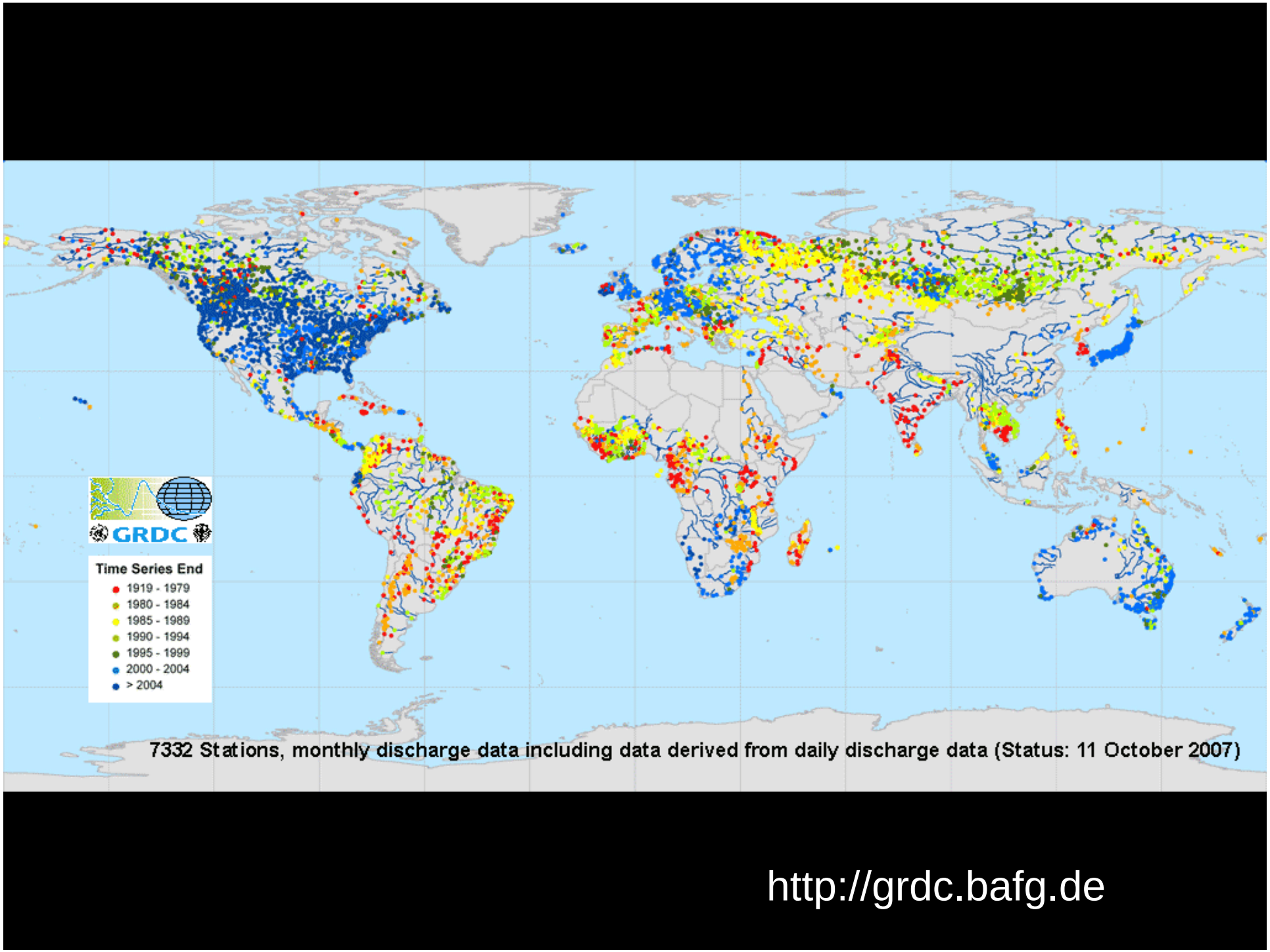
A community of researchers throughout Europe met at the "Hydrology from Space" workshop in Toulouse in September 2003 and called for a spaceborne platform capable of measuring surface water hydrology **(Cazenave et al., 2004)**.
During the same period, the NASA Surface Water Working Group (SWWG) worked to encourage space agencies worldwide to develop spaceborne technologies capable of collecting global surface water measurements that would help fill this void **(Alsdorf and Lettenmaier, 2003)**.
Given our basic need for fresh water, the most important hydrologic observations that can be made in a basin are of the temporal and spatial variations in water volumes stored in rivers, lakes, reservoirs and wetlands. Unfortunately, we have very poor knowledge of the global dynamics of terrestrial surface waters.

Thus, we propose the WatER Satellite Mission (Water Elevation Recovery) as a truly cooperative and collegial joint international effort consisting of researchers worldwide.

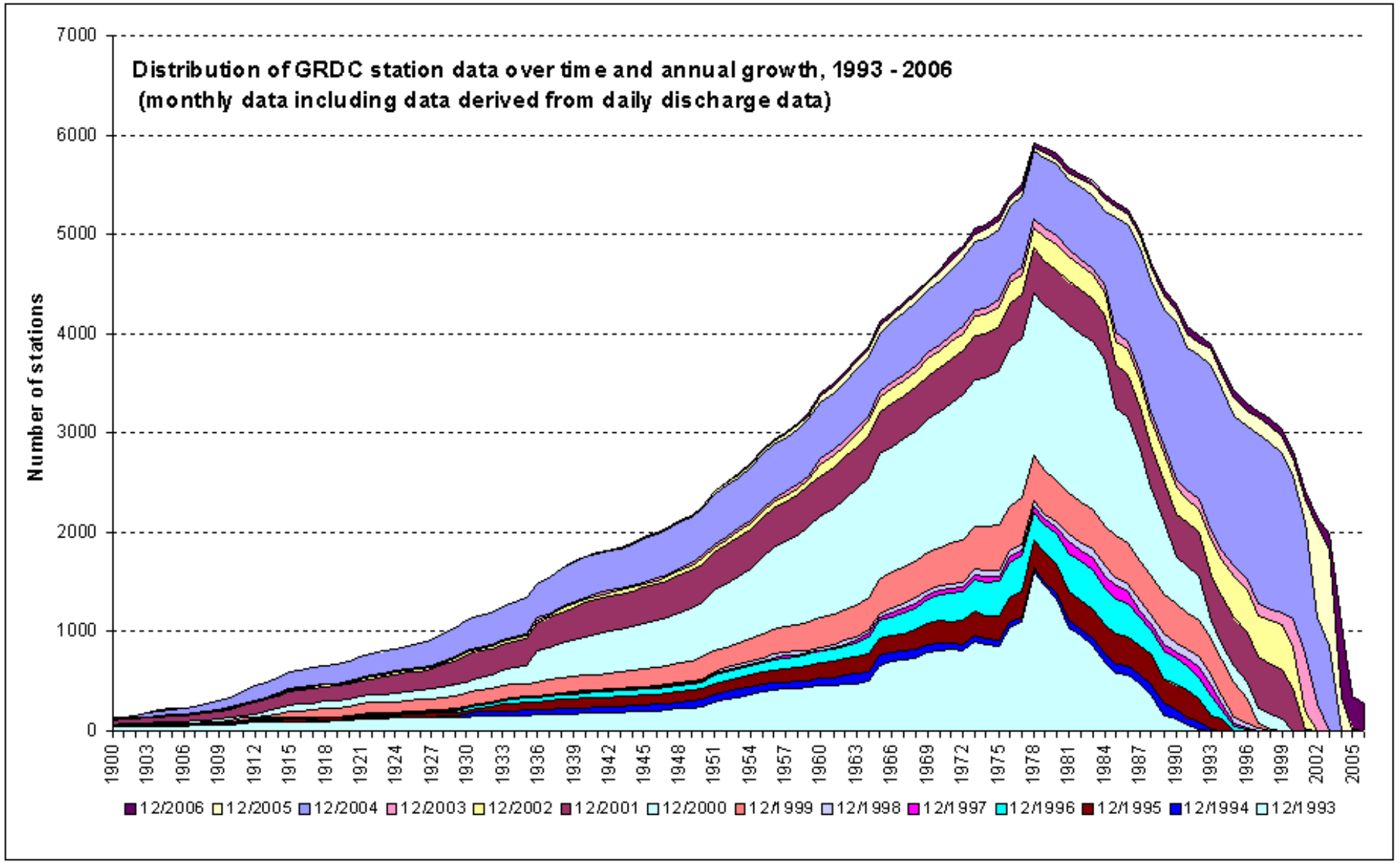


It is a near-nadir viewing, 100 km wide, swath based instrument that uses two Ka-band synthetic aperture radar (SAR) antennae at opposite ends of a 10 m boom coupled to a nadir SAR to measure the highly reflective water surface. Interferometric SAR processing of the returned pulses yields a 5m azimuth and 10m to 70m range resolution, with elevation accuracy of ± 50 cm.





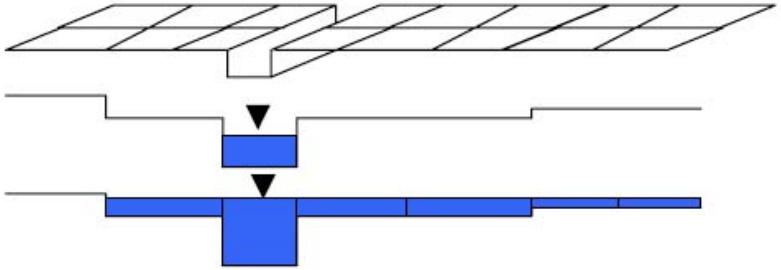
http://grdc.bafg.de



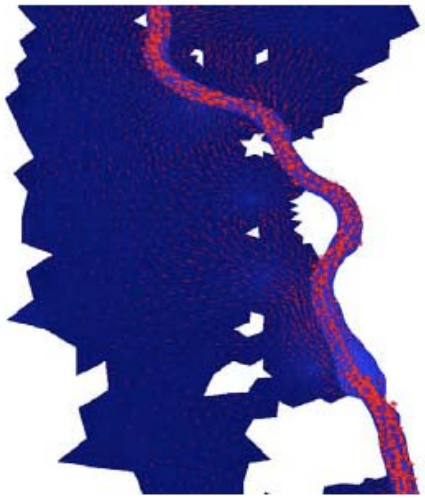
http://grdc.bafg.de

Model developments

- Simplified 2D physics e.g. LISFLOOD-FP



- Simplified solvers e.g. Matt Horritt's SFV

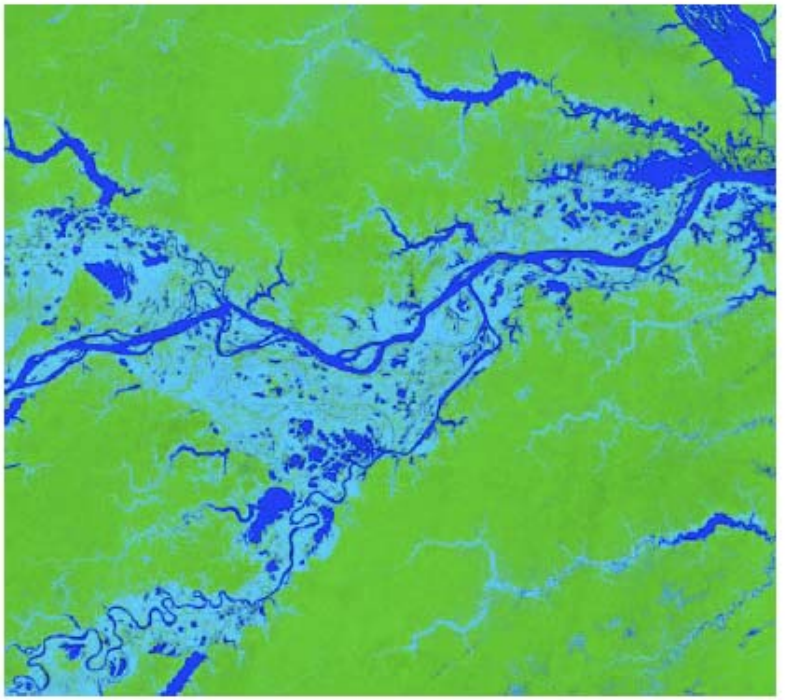


- Sub-grid scaling algorithms

(from P. Bates - Bristol U)

Model-data comparison

Model predicted maximum water depths
(note: tributaries and floodplains along other rivers, such as the Negro, are not represented



Observed inundated area at peak high water from SAR data (courtesy Doug Alsdorf, OSU)

(from P. Bates - Bristol U)

(from P. Berry - DMU-EAPRS)


esa
2nd SPACE for HYDROLOGY
WORKSHOP
Surface Water Storage and Runoff:
Modeling, In-Situ data and Remote Sensing
Geneva (Switzerland), 12-14 November 2007
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and thanks to the Scientific Committee!

SCIENTIFIC COMMITTEE

- **P. Bates**, Uni. of Bristol
- **P. Bauer-Gottwein**, Uni. of Denmark
- **C. Birkett**, ESSIC, Uni. of Maryland, NASA-GSFC
- **A. Braun**, Uni. of Calgary
- **R. Busskamp**, Global Runoff Data Center
- **J.-C. Calvet**, CNRM/Météo-France
- **J.-F. Cretaux**, CNES/LEGOS
- **P. Dubois-Fernandez**, ONERA
- **J. Famiglietti**, Uni. of California
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- **F. Seyler**, IRD/LMTG
- **B. Su**, ITC
- **W. Wagner**, TU Wien
- **M. Wilson**, Exeter University
- **E. Wood**, Uni. of Princeton

ORGANISATION & FURTHER INFORMATION

The Workshop is organised by ESA in collaboration with the co-chairs of the organising committee. WMO is the main sponsor offering to host the event at their premises and local logistical support. The Workshop will consist of oral and poster presentations selected by the Scientific Committee, with an opening and closing session, and will include a round table discussion.
Presenters of both oral and poster presentations are required to submit full papers to the Scientific Committee. Proceedings will be published by ESA.

WORKSHOP COORDINATION

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BACKGROUND

Continental waters have a crucial impact on terrestrial life and human needs, and play a major role in climate variability. Without taking into account the ice caps, fresh continental waters are stored in various reservoirs: the snow pack, underground reservoirs, the root zone (first few meters of the soil) and vegetation, and as surface waters (rivers, lakes, man-made reservoirs, wetlands and inundated areas).

Water on Earth is continuously recycled through precipitation, evapotranspiration, runoff, and vertical and horizontal diffusion and transfer in soils.

An improved description of the global water cycle, especially the yet poorly known continental branch, is of major importance for inventory and eventually better control of water resources available for human consumption and activities (agriculture, urbanisation, hydroelectric energy resources), as well as for climate prediction.

Remote sensing techniques can now be used to monitor water balance of large river basins on time scales ranging from weeks to months: among these, the most promising are satellite altimetry on surface waters (rivers and their tributaries, wetlands and floodplains) providing water levels and space gravity missions providing estimates of spatio-temporal variations of terrestrial water storage in soils (soil wetness and groundwater) and in surface water reservoirs.

To be used in conjunction with in situ observations and hydrological modeling, these observations from space have the potential to significantly improve our understanding of hydrological processes affecting large river basins in response to climate variability.

A first Workshop of this kind was held in Toulouse, France, in September 2003. The summary and recommendations, published in AGU's EOS, insisted on the organisation of a sequel meeting.

THEMES

1. ***Global hydrological modelling***: objectives, state of the art, improvement and requirements, contribution of space observations.
2. ***From Large-scale hydrology to Small-scale hydrology***: Do hydrology requirements depend on scale?
   How space techniques can answer these challenges?
3. ***Monitoring Spatio-temporal changes of surface waters***: applications to climate research and water resources management and contribution of space observations.
4. ***Space techniques to measure hydrological variables***
   - Global land hydrology and its geodynamic effects
   - Radar altimetry processing for inland water levels
   - SAR for DEM and water surface characterization
   - Accuracy and space-time resolution needed for global and regional hydrological model parameters
   - Rain, Snow and ice cover in river watershed and its role in the formation of river discharge
   - Steps towards estimation of river discharge from space
   - Other applications of space observations in large river basins (e.g., sediments transport, systematic mapping of wet areas, flood monitoring, use of altimetry for vertical referencing, etc.)
5. ***Data assimilation of space observations applied to hydraulic parameter identification***.
   Expected potential of space data in hydrologic and hydrodynamic modeling.
6. ***Strategic combinations of satellite and ground-based data for large scale hydrological monitoring***: improvement expected.
7. ***Round table discussion***: Current and future challenges in hydrology: What are they and how to face them?
   How to strengthen the collaboration between the two communities: hydrologists and space observation scientists?
   Synthesis and recommendations: action plan, future workshops.

Plenty of time slots for discussion!

SCHEDULE

Abstracts. . . . . 27 July 2007

Release of Preliminary Programme. . . . . 17 September 2007

Registration. . . . . 24 September 2007

Workshop. . . . . 12-14 November 2007

Release of Final Programme. . . . . at the Workshop

Submission of Full paper. . . . . at the Workshop

Publication of Workshop Proceedings. . . . . January 2008

Submission of Full paper.....at the Workshop

Seed Questions

Global Hydrological Modelling,

P. Bates and P. Bauer-Gottwein

1. How can remote sensing data help in real-time forecasting and adaptive management of water resources systems?
2. What can be gained from integrated atmosphere-hydrology modeling and how can remote sensing data be used to constrain such models?
3. How good are satellite data at constraining hydrological models compared to traditional data sources such as gauges?
4. What improvements in model performance would we gain from more highly resolved (both time and space) satellite data fields?"

Seed Questions

Space Techniques to measure Hydrological variables

C. Birkett and N. Mognard-Campbell

- Encourage presenters to:-
  1. Summarize the Merits/Limitations of the remote sensing technique. Compared to other techniques, what are the main sources of error?
  2. In reference to the altimeter data sets, think whether long-term time series could be reprocessed using their technique
  3. State the advantages of a single or multi instrument approach (follow-on mission or otherwise)
  4. Discuss what satellite-derived products have been validated and how? What are the steps for a validation?
  5. Discuss what are steps are necessary to assimilate the satellite products into the various hydrology models.

Seed Questions

And then address the very broad seed questions,

- "Does the remote sensing method meet the user-defined or science-defined parameter requirements"?
- What are these requirements and are they provided by the existing satellite products?
- What are the parameters that are missing and could they be provided by future satellite missions"?

Discussion and Summaries

The Chairs, with the help of volunteer rapporteurs, will draft a summary of the discussions, recommendations and actions to undertake in the future…

The main outcomes will be reported in the closing session

The chairpersons (and volunteers from the Scientific Committee) shall also prepare during the workshop a draft workshop statement for agreement by participants

Have a fruitful workshop!