The rationale of cooperating in space for Europe:

finding a balance between cooperation, competition and autonomy

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IFRI-SWF Annual Space Conference, Brussels, Belgium, 13 September 2012

"International Relations and Space: the European Approach"

The ICSU Committee on Space Research

A BRIEF INTRODUCTION TO COSPAR

COSPAR, a platform for international cooperation in space

- The Committee on Space Research (COSPAR) was established by the International Council for Science (ICSU) in 1958
- From its inception COSPAR's primary goal was to "*provide the world scientific community with the means whereby it may exploit the possibilities of satellites and space probes of all kinds for scientific purposes, and exchange the resulting data on a cooperative basis*."

COSPAR Membership

Prof. Giovanni Bignami, a renowned astronomer, is the President of COSPAR

- Forty-six National Scientific Institutions and thirteen International Scientific Unions are members of COSPAR
  - *Malaysia and South Korea joined COSPAR in 2011*
- Eight private and public entities are Associated supporters
- Over 8,000 scientists worldwide are “COSPAR Associates”, affiliated to one to three of eight Scientific Commissions

COSPAR Scientific Assemblies

- Held every two years in a different country
- Recent Assemblies attended by 2-3,000 participants
  - *Paris, France (2004)*
  - *Beijing, China (2006)*
  - *Montréal, Canada (2008)*
  - *Bremen, Germany (2010)*
  - *Mysore, India (2012)*
- Forthcoming Assemblies
  - *Moscow, Russia (2014)*
  - *Istanbul, Turkey (2016)*

A new initiative, the COSPAR Symposium

- The First COSPAR Symposium will be held in November 2013 in Bangkok, Thailand
- “Planetary Systems, both of our Sun and other stars and the Future of Space Astronomy”

CSAC – The COSPAR Scientific Advisory Committee

- Chair: Lennard Fisk (USA)
- Vice-chair: J.-P. Swings (Europe)
- Membership includes selected scientists, the COSPAR President and Vice-presidents, and Scientific Commission Chairs
- COSPAR is an *ex officio* member of the ESF/European Space Sciences Committee

New opportunities

THE TIMES OF INDIA, MYSORE
FRIDAY, JULY 20, 2012

Expert: TN village similar to Mars

Srinivas Laxman | TNN

Mysore: At Cospar 2012 (Committee on Space Research) here on Thursday, a student of Isro's Indian Institute of Space Science and Technology, Tushar Wankhede, revealed that an area which seems similar to Mars is a place called Muttom in Kanyakumari district of Tamil Nadu.

"The mud cracks and gullies at the Dunes of Muttom are like those on Mars. There's a similarity in the minerals too," he said in a presentation. He said when he and his team came to know about the area a year ago, they went there and started doing research of the zone. It was part of project work. "We have submitted a report to our institute and awaiting a response," he said.

Asked about its significance, he said Muttom can be used for doing Martian research. "By doing further tests of the site, we can know about the geological conditions of Mars and how it evolved," he told the gathering of space scientists.

Recently, there was a report suggesting that an area at Kutch in Gujarat bore resemblance to Mars.

The 'Mars in India' announcements come at a time when India is planning a Mars mission. Last week, Isro chairman K Radhakrishnan told media the mission was now in its final stage of approval.

In another presentation, a scientist said if Mars was inhabitated, fundamental biological questions could be addressed.

A PIE IN THE MARTIAN SKY

US, China talk on space collaboration

Srinivas L[illegible]man | TNN

[illegible] scientists [illegible] meeting [illegible] day even[illegible] at various scientific sessions at the Cospar meeting [illegible], another meeting took place unknown to many but which had political significance — a discussion between US and Chinese scientists about possible future collaboration.

US scientists told TOI the meeting tried to explore future areas of possible exploration. Requesting anonymity considering the sensitive nature of the meeting, they said it was very preliminary, while emphasizing that it will be a positive step if the US and China joined hands to explore the universe.

They said China's reach for the stars did present the US with an opportunity to cooperate and propose joint exploration. Said a scientist: "China's achievements in space needn't be a threat. The fears that if the US works with China it would be to the latter's advantage politically and scientifically is baseless. Their progress should be treated as an area for collaboration," he added.

A few American lawmakers, have always objected to US-China space cooperation because they feel the Chinese space programme is extremely secretive.

SMK awaiting

- While COSPAR mainly served as a platform for USA-USSR dialogue during the Cold War
- It now plays new role, as exemplified by recent informal discussions between US and Chinese scientists during COSPAR Assembly in Mysore

Finding a balance between…

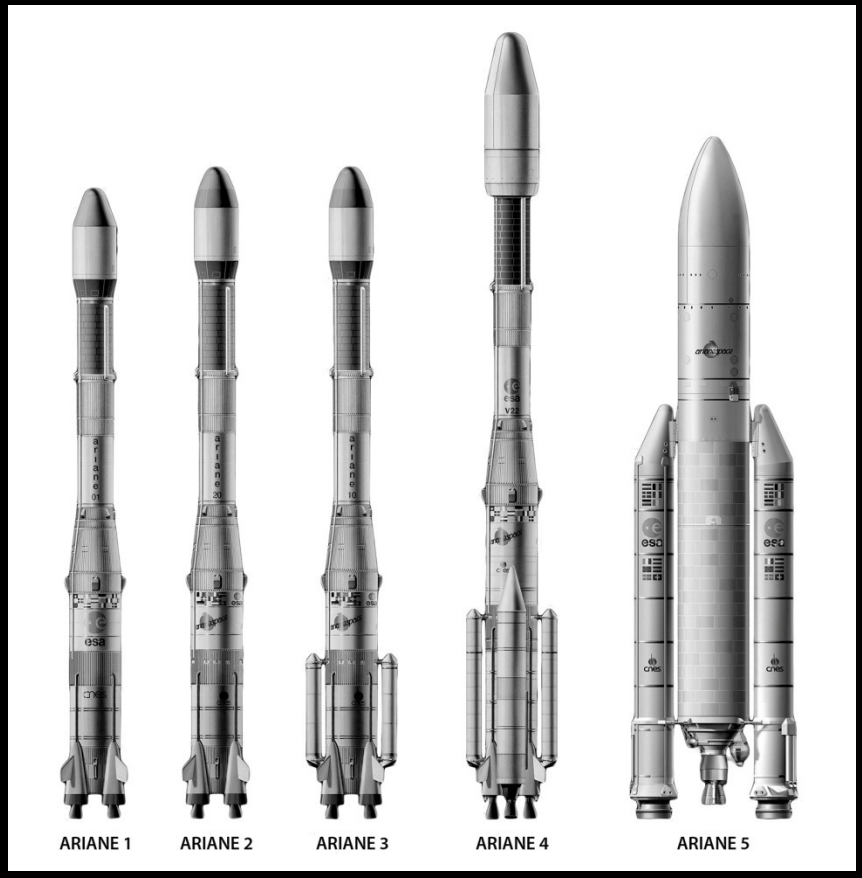
COOPERATION, COMPETITION AND AUTONOMY

Cooperation, competition, autonomy

- Relevance of these concepts and their combination
  - *Highly dependent on the space sector under consideration*
    - Launch capability
    - Manned spaceflight
    - Environment monitoring
    - Technological progress
    - Security
    - Economic growth
    - Science and exploration
  - *Competition is a common factor in all sectors*
  - *The desired degree of autonomy is highly variable*
  - *Cooperation is never absent and always mixed with competition*

Independent access to space…

- A critical issue of sovereignty
  - *Thanks to its independent access to space, Europe is one of the key world players in space*
  - *Ariane, Soyouz and Vega provides an obvious key to ensure Europe's autonomy*
- Independent launch capability is needed for autonomy in a context of high competition



…except for manned flight

- Cooperation is needed when it comes to manned space flight
- Europe's partnership in the International Space Station dwells upon its technological and scientific excellence
  - *Trained astronauts*
  - *Laboratories and service modules (Columbus, ATV, Cuppola)*

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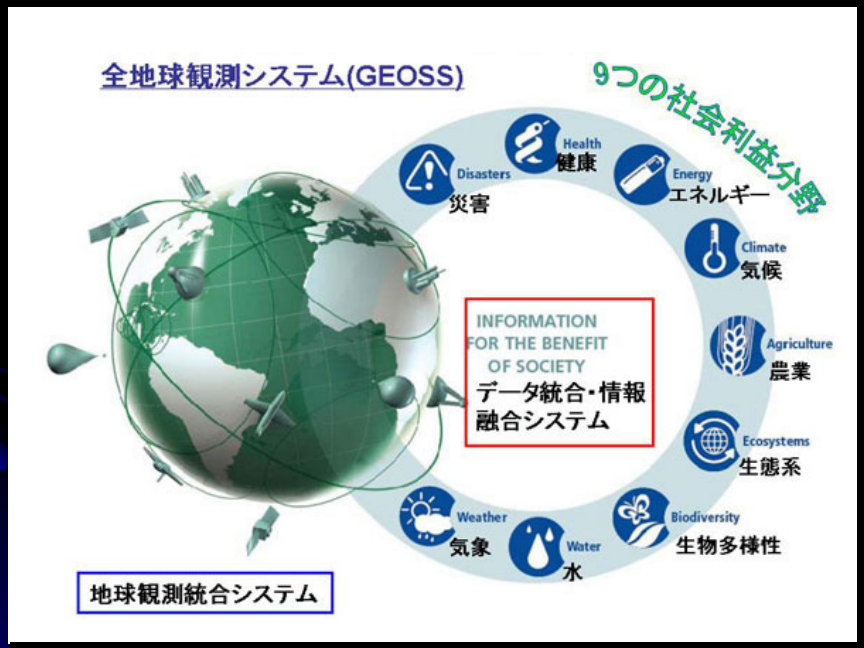
Environment Monitoring

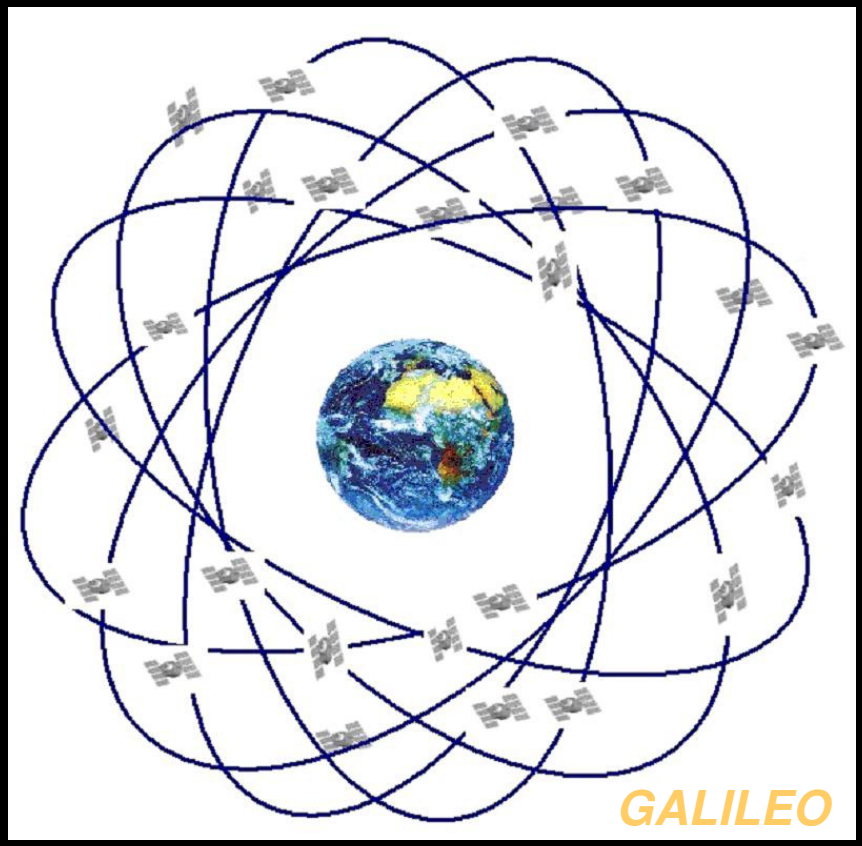


GEOSS, a Global Earth Observation System of Systems

- No single country (or group of countries) can afford to monitor the whole Earth system from space
  - *Space observation alone is not enough*
  - *International cooperation and open data sharing are an absolute necessity*
- This sector shows off the need for both cooperation and autonomy

Technological progress

- The entire European industry benefits from space programmes
- Technological innovation is pushed
  - *By the demanding requirements of space*
  - *By the new applications generated by space*
- This sector is highly competitive and critical for Europe's autonomy



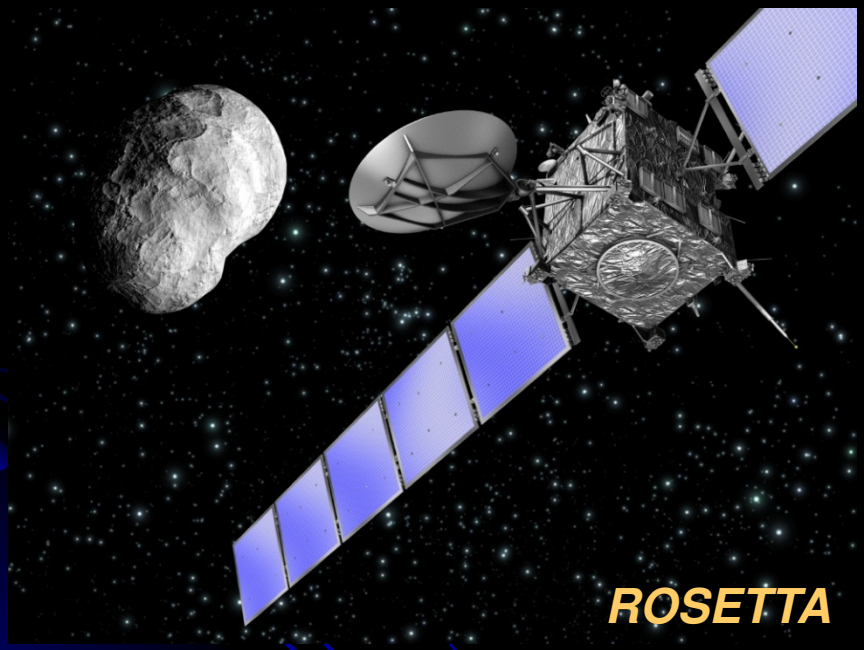
Security

- Europe (like the rest of the world) is facing new threats
  - *Some of the best responses to many of these threats can be found in space programmes.*
- This sector shows a complex mixture of cooperation (e.g. Charter) and competition (the 'security' component of GMES)

Economic growth

- Space is one of the leading sectors for growth and added-value in Europe's economy
  - *With a relatively modest public investment in space (~10€/year/citizen), Europe is one of the main space actors and benefits from a dynamic and competitive space industry*
- Competition & autonomy are the key words

Science and exploration



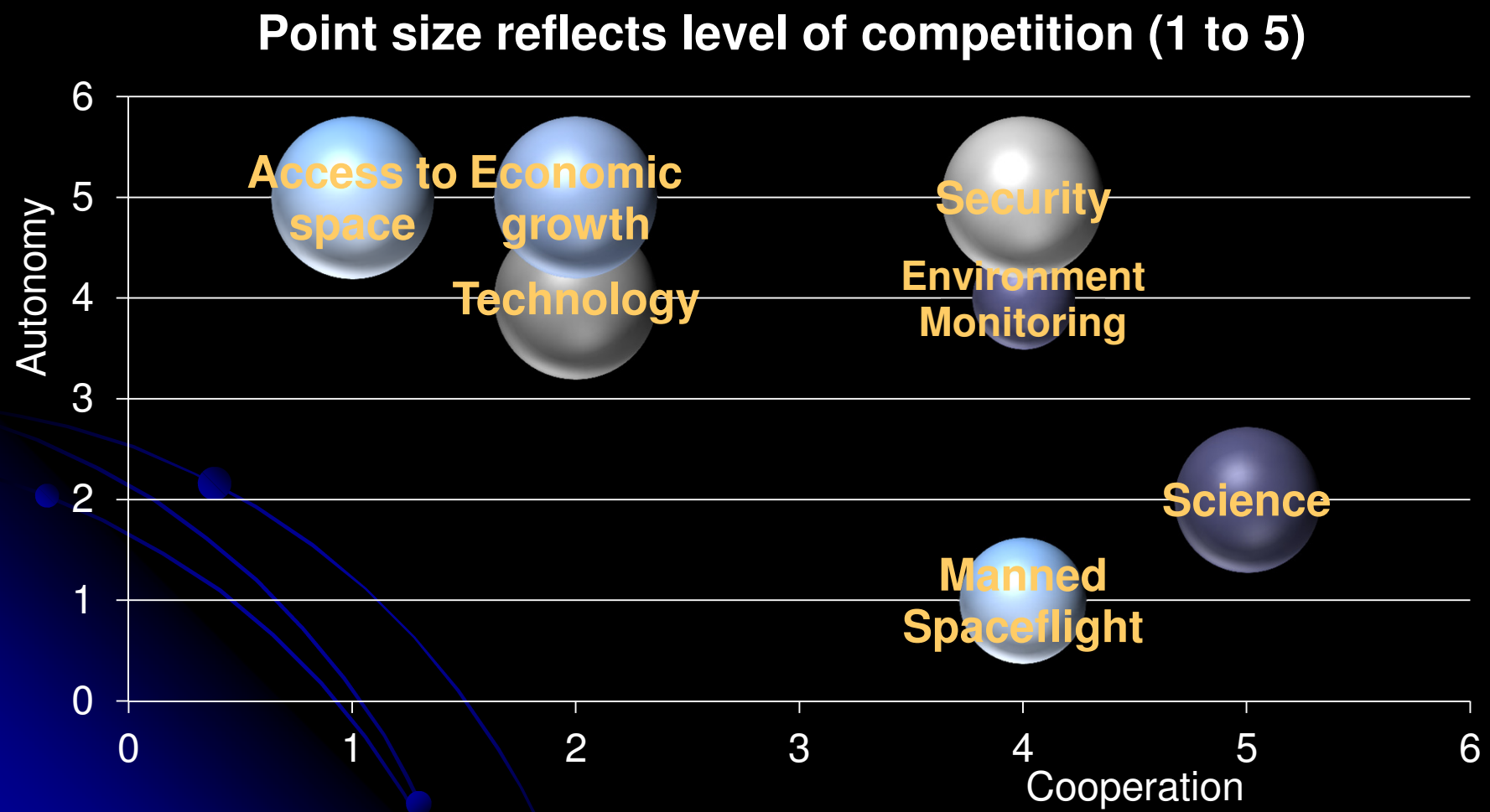
ROSETTA

- Space programmes nourish the scientific community and open new perspectives
  - *Europe is a recognised leader in key areas, including solar-terrestrial physics, Earth and planetary science, infrared and X-ray astronomy.*
- Competition and cooperation are key to science and exploration

Space cooperation almost always starts with Science

- Science was the first ESA programme
  - *Interest in the Science programme has driven most new ESA members (Romania), Cooperating States (Hungary, Poland, Estonia and Slovenia), and other countries (Czech Republic, Slovak Republic, Israel, Cyprus, Malta, Latvia, and Lithuania) which have signed cooperation agreements with ESA*
  - *The mandatory character of the Science programme facilitates the establishment of cooperation.*
- Conversely cooperation is more difficult for optional programmes (e.g. Earth observation)
  - *The ERS and Envisat satellites were 'purely' European, the Earth Explorer missions are almost totally European*
  - *NASA's and ESA's different selection and decision procedures prevented joint projects to come to fruition*

Autonomy vs. Cooperation



The pros and cons of…

COOPERATION IN SPACE RESEARCH AND ENVIRONMENT MONITORING

Against international cooperation

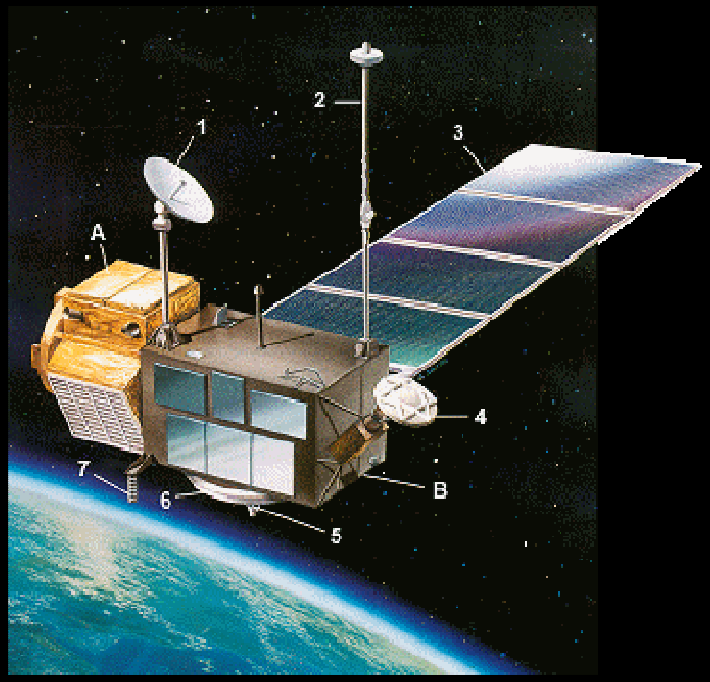
- There are many strong reasons why Europe SHOULD NOT pursue scientific international cooperation in space
  - *Decision*
    - Mission selection and decision processes and schedules are different
    - Scientific interests and motivation are different
    - Unexpected events may compromise the joint programme at any time
  - *Mission Cost*
    - Overall the cost of a cooperative mission is much higher
  - *Independence*
    - Your achievement is based on your own capabilities, without depending on someone else's competence, money, etc.
  - *Results*
    - Your community can use the data without having to compete with other scientists

In favour of international cooperation

- There are many strong reasons why Europe SHOULD pursue scientific international cooperation in space
  - *Decision*
    - Any decision is based on the combined interests and benefit from the best available expertise within the partners
  - *Mission Cost*
    - Sharing costs reduces each individual partner's contribution
    - The cooperative mission is generally of higher scientific value
  - *Independence*
    - Risks and obstacles are shared and faced with a larger competence and funding base, each other partner's commitment helps securing resources
  - *Results*
    - All data are made available to all scientists on an equal footing, thus allowing the best possible analyses to be performed and benefit to society at large

An interesting case

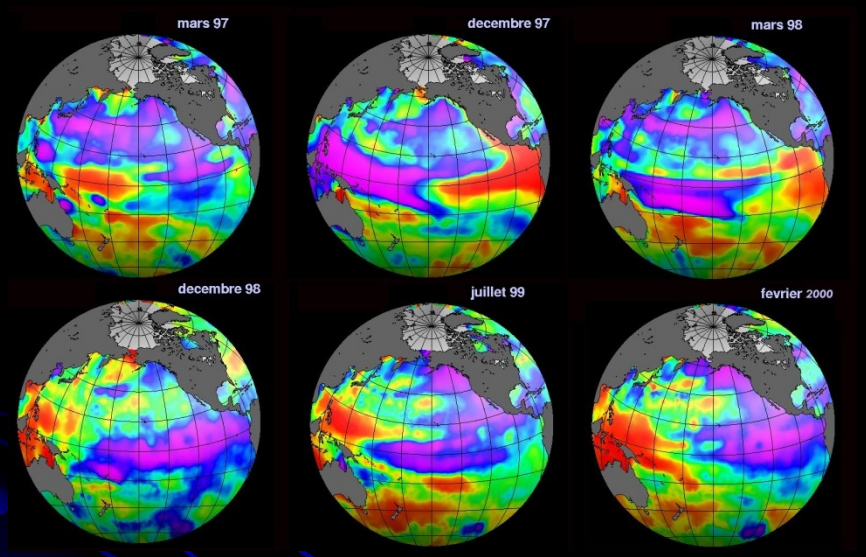
- USA and France concluded in 1987 an agreement to cooperate in satellite oceanography
  - *NASA provided the satellite and nominal payload*
  - *CNES provided two experimental instruments and… an Ariane launcher*
- Topex/Poseidon was launched 20 years ago, on 10 August 1992



Overcoming many obstacles

- Psychological aversion
  - *Lack of confidence, unwillingness to cooperate on both sides*
- Technology transfer issues and industrial competition
  - *Altimeter accuracy: TWT vs. solid state*
  - *Classified technology: "black box approach"*
- Political hurdles
  - *USA Senate hostility against using a European rocket*
  - *Highs and lows in US-French relationships*
- Costs and unbalanced contributions
  - *National option in France 3-4 times less costly*
  - *French contribution estimated to 10-20% of the total cost*
- Science exploitation
  - *Data policy*
  - *Disproportionate communities and equipment (1 to 10 or more)*

Topex/Poseidon has been an outstanding success

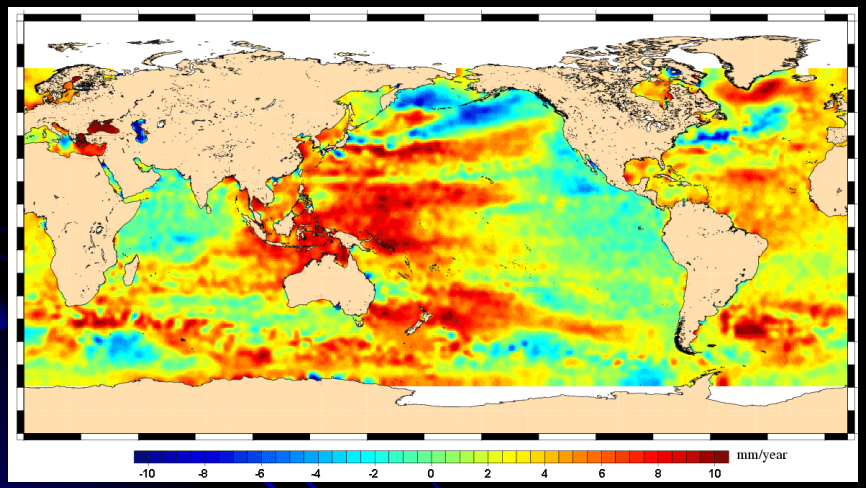


The 'El Niño of the century' as seen by Topex/Poseidon in 1997-98

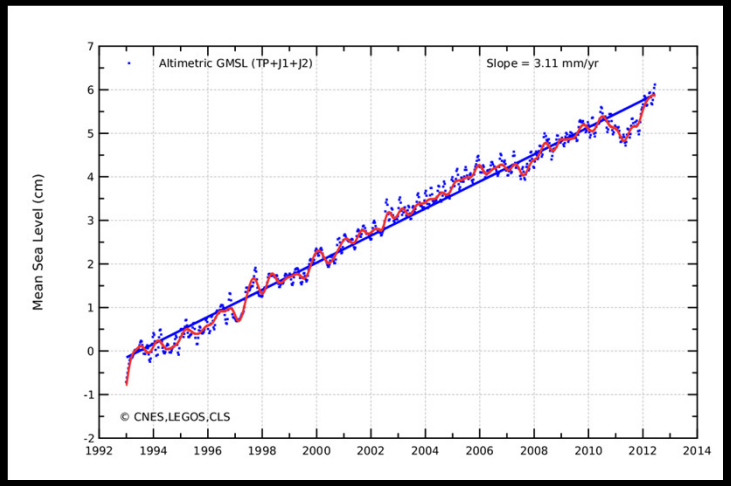
- Both the Topex and Poseidon altimeters prove 10 times more accurate than specified
  - *Ocean surface topography was measured with a 2 cm accuracy (mission goal was 13.7 cm)*
  - *Planned for 3 years, possibly extended to 5 years, the satellite was operated for more than 13 years*

Sea level rise
A key climate indicator

13 years of sea surface topography: a global image of the ocean slopes



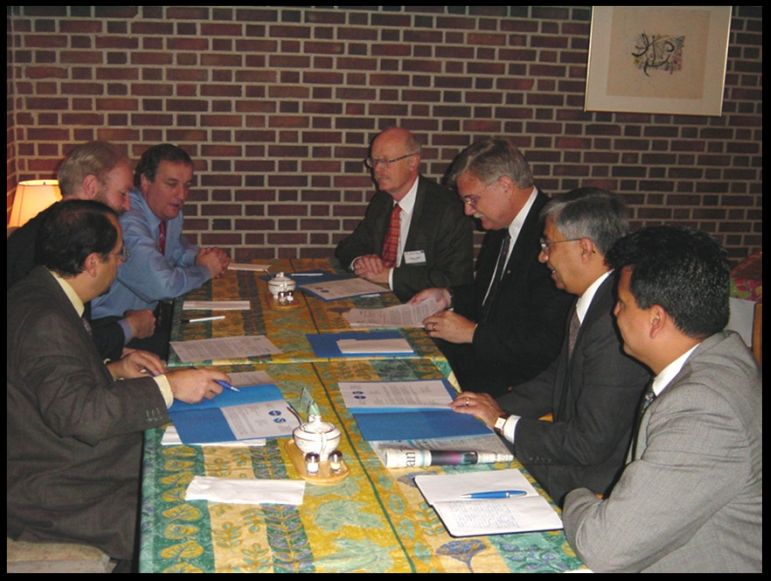
Global mean sea level: +3.1 mm/year, based on T/P, Jason-1, Jason-2), 1992-2012



New fathers and new babies

Jason-1 was launched on 7 December 2001, but the cooperation scheme was completely reversed

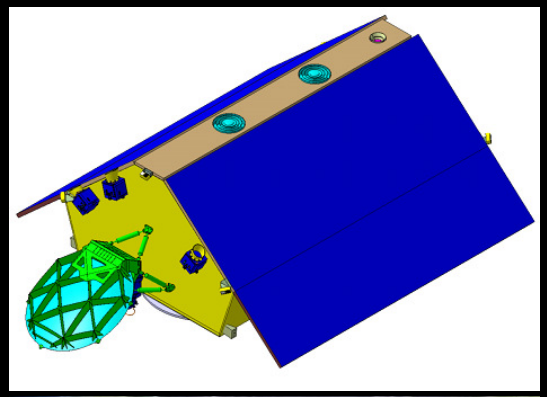
A 4-party agreement for Jason-2/OSTM was signed in Kyoto on 7 November 2001 by NASA, CNES, NOAA and EUMETSAT

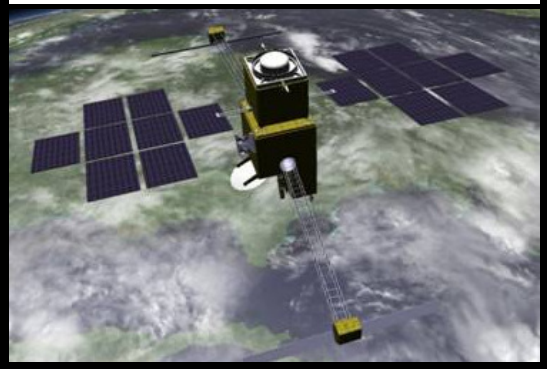


A suite of missions to monitor sea level rise

Jason-2 was launched on 20 June 2008, Jason-3 will follow in 2013

A new generation of altimetry satellites is in preparation Jason CS, SWOT, involving the same partners and ESA





There are more benefits than losses in space cooperation

- International collaboration has been the best way to secure resources for all partners, based on commitment and confidence
- The integrated cooperative strategy has provided altogether technological benefits, financial merits, has helped the transition of research systems into operational status, and has ensured the harmonization of international programs
  - *Smooth funding profiles*
  - *Savings from block procurement*
  - *More/better observing systems with less money*
  - *Larger benefits for all of timely, open data access*

Cooperation is other scientific space sectors

- Manned space flight
  - *Since ESA's astronaut corps was formed, the Space Shuttle has been the primary launch vehicle used by ESA's astronauts to get into space through partnership programs with NASA.*
  - *In the 1980s and 1990s, the Spacelab program was an ESA-NASA joint research programme*
- Exploration
  - *NASA has been ESA's main partner: Cassini–Huygens, the Infrared Space Observatory ISO, INTEGRAL, SOHO, the Hubble space telescope, the James Webb Space Telescope, the Laser Interferometer Space Antenna LISA.*
  - *Despite NASA recently withdrew from ExoMars, both ESA and Japan have recently made clear that they remain committed to working with the US.*

Other European space partnerships

- China
  - *ESA is one of the most important partners of the Chinese Space Agency. The two space agencies cooperated in the development of the Double Star mission in solar-terrestrial physics.*
- Russia
  - *ESA entered into a major joint venture with for launches of Soyuz-2 rockets. Roscosmos has offered its Help for ExoMars.*
- India
  - *ESA agreed in 2008 to send instruments into space aboard the ISRO's Chandrayaan-1 Lunar mission.*
- Japan
  - *The most notable current ESA-JAXA projects are the BepiColombo mission to Mercury and the EarthCARE mission looking at the radiation budget and water and energy cycle.*

Conclusions ?

- Cooperation is space research and exploration and in Earth monitoring is and will be more and more a basic ingredient of European space programmes
- Competition in all space sectors is and will remain the inevitable background in all space sectors and activities
- Autonomy is and will remain a critical goal of Europe's space programmes as regards access to space, economic growth, technological progress, security and to some extent, global monitoring

Thank you for your attention!