Perspective on Science/Mission Coordination
“A work in progress”

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- CNES contribution 211M Euro/$269M (28% LCC, 3 yrs ops)

- The Investment Program drivers
  - Innovative aspects
  - Economical aspects are relevant and important for the program
  - Flight in 2019 (LRD)
  - Constrained framework: respect the fixed budget
  - Need to be on the same timeline with NASA and JPL

- A dedicated line to the development of the downstream services
  - A SWOT Preparatory Program

- A need to secure the budget (margins)
Need to formally close out remaining open work-share items.

Draft new NASA/CNES MOU for period beyond 1/1/13.

Prepare for a “Pre-formulation Mission Study Review” at NASA HQ in December. Similar to last year’s “Summative Assessment.” it is meant to help ESD management catch up on all missions in development and prepare budget guidance.

Finalize ROSES element for SWOT Science Definition Team. ROSES 2012 publishes in February. Tentative timetable – proposals end June 2012, start 1/1/13.

NASA Planning for Mission Concept Review in 2012 and transition of SWOT to Phase A.

Budget uncertainty in DC remains high but Earth Science Division expects to fund its plans in 2012
Outputs of the bilateral meeting, September 8th

- NASA-CNES SWOT bilateral meeting at NASA HQ on September 8, 2011
- NASA-CNES SWOT Amendment to the Implementing Arrangement (pre-phase A and phase A) signed - September 8, 2011, includes:
  - Scientific field campaigns (AirSWOT) → 2013 in France if possible
  - Exchange of personnel
  - Set to expire December 31, 2012
- For CNES, secure the margins of the project if necessary -> Trade-off
  - Nadir Ku-C Altimeter
  - Near Nadir interferometer on board Karin
- DORIS mandatory for accurate and precise orbitography
SWOT Science

• High-level questions:
  – How to organize the science internationally to best support the SWOT project?
  – What mechanisms will be used by NASA and CNES to select and support the needed science?
  – What new (SWOT-unique) science infrastructure is needed?
  – What existing mechanisms in NASA and CNES will be used to jointly support SWOT?
2 kinds of science?

- Not perfectly separable, but worth recognizing....
  - Remote Sensing Science – Peculiar to mission and the signals being sensed. Physics of the mission. (CNES/”Methological”)
  - Natural Science – Peculiar to the environment and the system under study (Earth, ocean, hydrology). Physics of the system being sensed. (CNES/”Thematic”)
NASA Science Approaches

• “Project Science” – Science contracted by a flight mission to ensure mission success. Algorithms, cal/val, data products, remote sensing science (e.g. RFI, signal corrections). Generally conducted via contracts.

• “Competed Science” – Research solicited from the science community (via ROSES). Guest investigators, natural science and remote sensing science, could be any aspects where solicited contributions and grants are the best vehicle.
NASA Science Team Approaches

• “Measurement” Science Teams (e.g. Ocean Surface Topography, Ocean Vector Winds) – Systematic, mature measurements.
• “Instrument” Science Teams (e.g., MODIS, AIRS) – developmental, complex multi-application instruments
• Science Definition Teams (e.g. Decadal Survey missions) – Early development phases
• Product Development Teams (e.g. Measures, Reason) – Climate data records, multi-mission analysis.
A Lifecycle of SWOT Science Organization?

- Formulation/Phase A - Science Working Group (now)
- Phase A/B - Science Definition Team/Project Science Team + SWOT Preparatory Project?
- Phase B/C/D - Project Science Team or SWOT (Instrument) Science Team?
- Phase D/E – Specialized Ocean and Hydrology Science Teams?
The Lifecycle of SWOT Science?

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<th>Mission Phase</th>
<th>Execution</th>
<th>Support</th>
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<td>Formulation+Phase A/B</td>
<td>Proj Sci and Team Leader</td>
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<td>Science Definition Team (SDT)</td>
<td>Competed (ROSES)</td>
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<td>Project Science Team</td>
<td>Contracted (SWOT Project)</td>
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<td>Co-Opted (OSTST, NEWS, etc)</td>
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<td>Measurement Science Team(s)</td>
<td>Competed plus DA part of mission</td>
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Phase A/B
Project Science Team (NASA) or SWOT Preparatory Program (CNES)
“Logical Organization”
Leadership

NASA
Program Scientist (EL)
Project Manager (PV)
Ocean Science Lead
(LF)
Hydrology Science
Lead (DA)

CNES
Program Scientist (SC)
Project Manager (TL)
Ocean Science Lead
(RM)
Hydrology Science
Lead (NM)

SWOT Project
Science Team
Leadership
Science Definition Team

ROSES12
(Call 6/12, Prop. 9/12, Sel. 12/12)

+ TOSCA
(Call ?, Prop.?, Sel.?)

= Science Definition Team
(LRD 1/2013)
Project Science Team

SWOT Project/Contracted Science

+ Co-Opted Thematic Science Projects

= Project Science Team
**Objectives:**

- To define, evaluate, and prepare adequate future services
- To prepare users to develop their own routine processes
  - “in very close cooperation with the final users”
  - “at SWOT level to give the best answer”

**Two complementary approaches**

- **Methodology:** Researchers and engineers from research institutes and space agencies (NASA/JPL and CNES)
  - Definition and development of tools for the operational exploitation of the images:
    - High volume of data’s: Automatic processing mandatory
    - Processing techniques to be adapted to the new images and physics
- **Thematic:** Users (mainly from institutions and/or private companies)
  - Better understanding of the users' needs in terms of services
  - Better understanding by the users of the performances and system limitations

**Simulated SWOT data:** Airborne campaigns and simulated data
SWOT Thematic Part:

1- **Ocean**: see the Lee-Fu and Rosemary presentation on the primary and secondary science: different items to be structured

2- **Hydrology**: different applications (assimilation, hydrodynamic models at different scales, river discharge etc…)

3- **Coastal zone**: River/freshwater discharge in operational ocean models etc..

4- **Other secondary science**: monitoring sea-ice & iceberg movements

Open to international experts
Science Mechanisms to support the Preparatory Program

- **A Joint NASA/CNES activity with common objectives in solicitation Components:**
  - Primary thematic science (Oceanography and Hydrology)
  - Secondary thematic science (Coasts, Cryosphere, etc)
  - Methodologies (SWOT products and services)
  - Risk reduction/simulation (Airborne program and simulator)

- **Prepare a joint SDT implementation plan**
  - From now to MCR (mid 2012) : A core group project team closely linked to Science Team (SWG)
  - Mid 2012 to 2019 : update the SDT with respect to the project needs wi
  - Develop list of priority items for a SDT solicitation

- **A need to coordinate before the 2012 Roses and TOSCA tenders : February, 2012**
Back-up Slides
The “thematic driven” approach which is proposed during the SWOT preparatory programme has a twofold purpose:

- **Check whether SWOT data can meet the thematic requirements**
  A panel of validation studies will allow to check this in a large number of situations, through the use of simulated data.

- **Simplify and automate the production of specified information requirements, through adapted and efficient tools**
  Issues addressed by methodological network, **Algorithm development, R&D, thesis and post-doc** : the most important needs expressed by users.

Such purpose can only be met through

- **Relationships between Thematic and Methodology partners**:
  Methodology interest/competence areas list ↔ Thematic studies topics

- **Joint technical work, mainly (and logically) in the framework of Thematic validation studies**.

Thematic studies should/could also be the place for “**inter-WG work**” when covering common interest applications (coastline & ocean; coastline & hydro, ...) : share of data, experience, results...
Questions for an SDT Charter and Responsibilities

■ How can it be insured that the SDT is responsive to project needs during different phases of the project?
■ How will it be arranged such that key science deliverables required by the project (e.g., tidal corrections) are produced in a timely manner?
■ How will the extra-scientific responsibilities of the SDT be specified (e.g., review of project algorithms for meeting the science requirements)?
■ How will the charter and composition of the SDT change over the mission lifetime to satisfy project needs?
■ How will higher algorithms developed under the SDT be incorporated by NASA/CNES or the project? Will the algorithms be shared and made publicly available?
■ How will AirSWOT support the SDT? Team members propose for AirSWOT air time as part of their proposals?
■ Will the SDT distribute or share responsibilities between NASA and CNES (or both)? How will the distribution of responsibilities be arranged and coordinated?
■ How will the leadership of the SDT be shared between NASA and CNES, oceanography and hydrology?