

Synthesis

of the Atmospheric Science Session

(My) Personal Preface

- Plays a key role in European (if not worldwide) ballooning
- All kinds of balloons used
- All important geophysical conditions to be covered
- Science topics reaching from the boundary layer up to the upper stratosphere
- A number of very experienced groups developing/operating world class instrumentation, flexible enough to address new/upcoming scientific questions
- In many cases data records heading back to 10 to 40 years available
- Balloon groups often did pioneering work that has resulted later in successful space instrumentation

Basic elements for a future programme

(taken from Neil's overview talk)

- Strong scientific rationale
- Reason to use balloons
- Joint use of measurements for science and satellite validation
- Access to suitable launch sites
- Implementation of measures to improve communication and reliability
- Efficient launch and flight operations
- Improved balloon technology to expand the range of scientific opportunities
- Continued instrument development to use the latest technologies
- Continued use of reference instruments for consistency in long time series
- Funding and planning at the European level

Strong scientific rationale

- stratosphere - stratospheric / climate coupling
- long term monitoring: decadal changes
- mesoscale processes and their role for the global scale
- bridging gaps between satellite mission
- UTLS - new processes (e.g. high energy)
- lower atmosphere - remote boundary layer

Reason to use balloons

- Unique for the altitude range above ~18 km
- Provide the vertical dimension all the way from the free troposphere to the upper stratosphere (linkages)
- Temporal and spatial scales hardly to be addressed by other carriers
- Indispensable for satellite validation
- Secure continuing of long term data sets
- Ideal carrier for proof-of-concept of new instruments (Closest in environment to space missions)

Access to suitable launch sites

Mandatory sites:

- Mid-latitudes (France preferred: home bias)
 - CNES to let scientists know by when the base will operational once again (achievements in precision landing)
- Arctic: Kiruna, established for concerted big campaigns (with CNES) and for dedicated mini-campaigns
- Tropical: Teresina
 - European and Brazilian Scientists to form a joint group of interest (Manaus meeting)
 - CNES (+ other European agencies?) to intensify/improve cooperation/agreement with INPE for securing the site for the coming decade)
 - CNES+SSC to think about sharing the operational load during the campaign ?

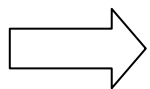
Ability to set up **transient sites** for some campaigns (e.g. Seychelles, Svalbard, Trapani)

Implementation of measures to improve communication and reliability

- Positive move obvious during recent operational Teresina campaign
- Thien Lam Trong introduced yesterday
- CNES to carefully review the measures (still to be) taken resulting from the audit process and the Paris meeting 3 years ago

Efficient campaign, launch and flight operations

- Easy access, efficient operations - **need to keep costs down**
- **Clear and reasonable safety rules**, including the experience of the ops manager, and not just relying on parameterized numerical models
- **Respect scientist's limited resources** (Teresina scientists had to miss their equipment e.g. >14 months) and **responsibilities** for graduate and undergraduate students
- **Avoid campaigns before flight authorizations are settled and security rules** are made clear to everybody
- **Utilize all resources and capabilities from the various ranges and operators** in the best possible way disregarding national 'sensibilities'



N.b.: the patience of scientists is limited, also there are other ways to do good science (e.g. aircraft)

Improved balloon technology to expand the range of scientific opportunities

- Towards precision landing
- Towards long(er) duration flights of different kinds of balloons
- Improved gondola and TM/TC systems
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- Avoid duplication/multiplication of efforts: great need of cooperation enabling synergies and enhanced cost efficiency
- Competitiveness against other carriers

Continued instrument development to use the latest technologies

Continued use of reference instruments for consistency in long time series

- Responsibility of national labs and funding agencies
- Mission-independent monitoring (ESA), calibration issues, linking data sets of different missions
 - ⇒ the role/responsibility of ESA in helping to maintain capacity on an European level
- Securing European balloon science and technology capacity
- Joint use of satellite and balloon measurements by combining the mutual strengths of balloon and satellite capabilities (overcoming simple validation)

Funding and planning at the European level

Factors:

- Variety of funding mechanisms and reasons to fund science
- Decreasing funding at European level
- Cost and reliability

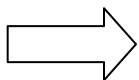
Risks:

- Nationally supported research will not remain cohesive
- Role of EORCU uncertain

Needs:

- Pan-European mechanism to facilitate planning
- Take a medium-term view in planning (different timescales)
- Combined scientist / balloon operation membership

Informal standing committee - ESA, ESF, EC?



Topical session during upcoming ESA-PAC Meeting in Bad Reichenhall/Germany (June 2009)

What would come out of a successful workshop?

Agree science ambition for next 5-10 years

- Done on a generic way
- Intercultural mismatches
- EORCU fading away
- Critical mass of top scientific issues necessary to place successful proposals
- Scientists have to organize themselves
- Leadership not obvious

Improve understanding of scientific and operational constraints

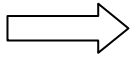
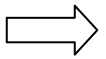
- Good step forward, but handling of safety issues not convincing and probably not success-oriented

Define main areas of European balloon activity for coming years

- Agreement reached on a generic level
- Decisions to be left to reviewers

What would come out of a successful workshop? (cont.)

Prioritize - identify themes of common interest

- launch sites  broad agreement, but ways of implementation and timeline uncertain
 - measurement strategy (regular/campaign/focused)
 - balloon developments
-  decision taking should consider areas where balloons are unique and where there is the highest impact on scientific/technological reputation

New planning structure to be implemented

Emergence of new leaders

- both on the scientific side and the operators side (incl. a fair share of responsibilities and exchange of expertise/technology)

Document will be finalized (particularly ch. 4) reflecting the synthesis and discussion within the coming weeks