



Splinter Session C - Summary

Peter Thorne (Chair), Clement Albinet, Jose Moreno (Rapporteurs), Ben Veihelmann (Observer)
EO Science Strategy Workshop, 19-20 June Bruges, BE


13/06/2023

ESA UNCLASSIFIED – For ESA Official Use Only



THE EUROPEAN SPACE AGENCY


1



EO Candidate Science Questions Review Splinter (Room Vives – Green Badge)

- CSQ13. Would it be of value to develop a system of systems while combining different types of satellites under different orbit constellations to advance monitoring capacities (e.g., diurnal cycle, higher resolution)?
- CSQ15. Which specific observations are needed: polar / tropical regions, new measurement techniques vs long-term series of observation, large-scale field experiments?
- CSQ14. What are the main issues with calibration-validation, absolute calibration, long-term monitoring?
- CSQ09. What are the characteristics of the processes related to climate extremes and the hazards related to them?
- CSQ11. How can we improve early warning of extreme events and climate hazards?
- CSQ56. Where and how are ecosystems undergoing critical transitions?
- (Missing) How will atmospheric circulation respond to emissions of greenhouse gases and aerosols and how will this impact regional climate change?
- (Improvement to CSQ 51) What is the role of lower atmospheric processes (via tides, planetary waves, gravity waves and infrasound) on Space Weather? Don't restrict to variations of the lithosphere.
- (New) Global agriculture monitoring in the context of rapidly changing climate & extreme weather events
- (New – time permitting) Natural Capital Accounting applying novel remote sensing data

2



THE EUROPEAN SPACE AGENCY

2

Over-arching comments – Matrix Approach ?



- Many of the current candidate science questions are cross-cutting and methodological in nature rather than science questions per se.
- But at the same time, they raise critical issues that are important not to get lost
- Suggestion that these methodology questions of when / how to observe, cal/val etc could be horizontal cross-cutting questions that all the more specific science questions could answer how would help:
 - Diurnal sampling
 - Spatial sampling
 - Cal/Val
 - Uncertainty characterization and target
 - Etc.
- If for all the science questions that remain e.g. diurnal sampling is defined as being critical then that provides a clear signpost as to what is critical
- Needs a process to decide which become horizontal questions to be addressed by all remaining specific vertical questions

Does this proposal have merit?



THE EUROPEAN SPACE AGENCY

3

CSQ-09, CSQ-011: Extreme Events



- Science questions are around understanding the processes around and evolution of extremes vs monitoring questions
 - Assumption science questions in scope
 - Assumption that monitoring out of (current!) scope
- Important to be synergistic with emerging activities such as WMO Early warning systems for all agreed at recent WMO congress
- What are the critical scientific questions around:
 - Understanding precursors to extreme events?
 - Process understanding
 - Lifecycle of an extreme
 - Compound and cascading events



THE EUROPEAN SPACE AGENCY

4

CSQ-056: Critical transitions in ecosystems



- Which ecosystems?
 - Different ecosystems draw different challenges
 - Critical transitions vs tipping points?
- Principal need is long-term monitoring to understand ecosystem health
 - Do we observe everything necessary?
 - Do we have long-term continuity?
- Not just terrestrial ecosystems – ocean ecosystems also important in terms of feedbacks and processes



5


(Missing) Role of changing forcings in atmospheric circulation



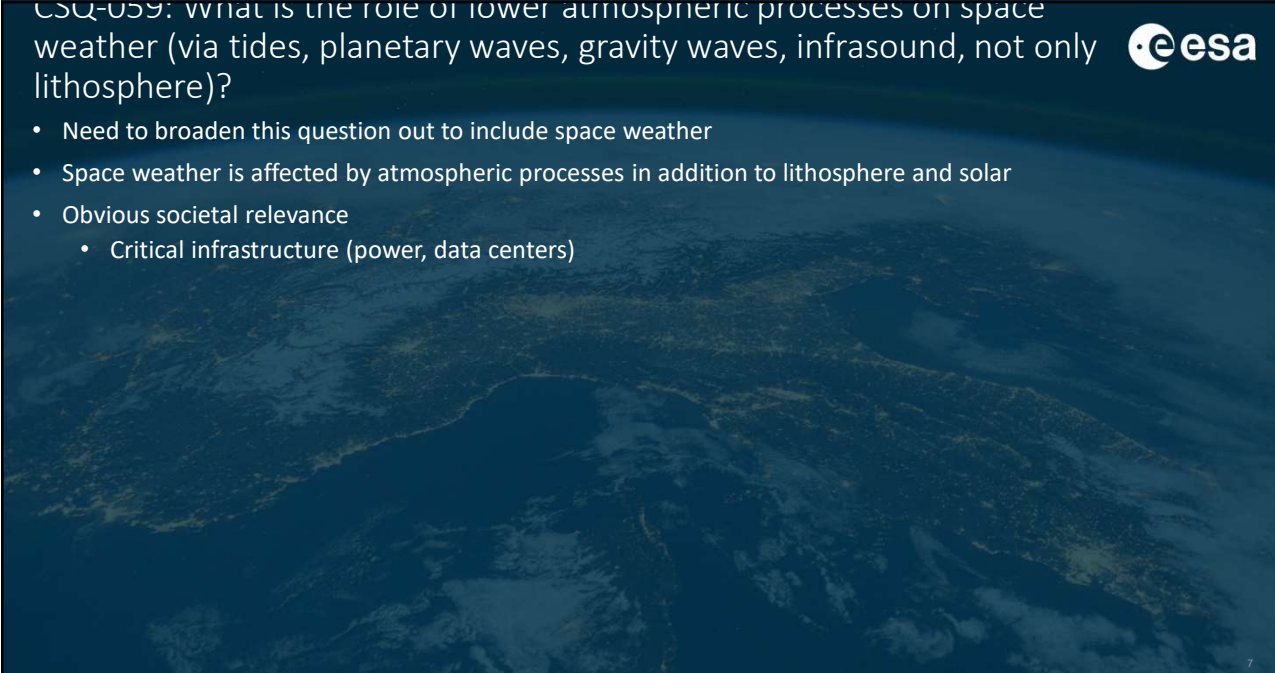
- Identified in IPCC AR6 as key uncertainty
- We are already rapidly altering the mix of SLCFs which may be affecting regional circulation
- What are the key processes that are not well understood?
- Circulation changes not just in troposphere but also (at least) the stratosphere in response to changing forcings




6


CSQ-059: what is the role of lower atmospheric processes on space weather (via tides, planetary waves, gravity waves, infrasound, not only lithosphere)? 

- Need to broaden this question out to include space weather
- Space weather is affected by atmospheric processes in addition to lithosphere and solar
- Obvious societal relevance
 - Critical infrastructure (power, data centers)





7  + THE EUROPEAN SPACE AGENCY

7

New Question: Global agriculture monitoring in context of climate change and extreme events 

- Very obvious and growing societal relevance: How do we feed 8 billion+ people sustainably in a warming world?
- Key hot spots e.g. Sahel poorly monitored / understood
- What is needed?
 - Exploitation of existing measurements?
 - new measurements?
 - Or both?
- If to be included needs new question to be fully formulated for consideration



8  + THE EUROPEAN SPACE AGENCY

8