

OBJECTIVE: Provide CEOS agencies with consolidated user requirements on parameters measurable from space that help in assessment of land-based fresh water characteristics and dynamics. These parameters should cover a broad range of application interests from potential user groups including, but not limited to, climate monitoring, agriculture, water resource management, environmental assessment and international reporting. The outcome of this initial workshop will be a draft paper outlining current opportunities and critical gaps around freshwater observations from space and associated data services that in turn may provide space agencies with a consolidated rationale and priorities for ongoing and future investment in key observational capabilities coordinated through CEOS.

Structure and organisation of the workshop.

The CEOS Freshwater from Space workshop will bring together experts representing the user community, international coordination initiatives and organisations (AQUAWATCH, GEOGLOWS, IGWCO, GEWEX, WMO) and technical experts in space based earth observation techniques capable of providing relevant observations and variables for current and future use by this user community.

The workshop will take place over three days broadly organised along the following lines:

- **Tuesday 13th November.** A full day will be set aside to bring all of the workshop participants to the same level of information on the state of the art in
 - our understanding and monitoring of the water cycle,
 - our capabilities in observing fresh water quantity and quality (from space and in situ)The status of various key initiatives in the domain will also be presented and a 1h discussion session set aside to take stock and summarize the state of the art.
- **Wednesday 14th November.** The morning session will involve presentations from those CEOS agencies that are able to summarise their programmes for freshwater from space, what is and is not covered by current and confirmed EO sensors that are relevant to monitoring of each of the water resources, including required in-situ measurements and complementarity with space-based EO. The break-out sessions will be organized at the end of the morning and will run through to a Preliminary gap-analysis discussion which will occur at the end of the afternoon.
- **Thursday 15th November.** Break-out sessions focused on gap-analysis will take place in the morning. In the afternoon all the workshop outcomes relevant to a CEOS Freshwater from Space Strategy will be discussed, summarized. Finally a planning will be proposed for next steps to develop this CEOS Freshwater from Space Strategy in accordance with the CEOS SIT meetings (April 2019 and September 2019) schedule and the CEOS Plenary meeting in November 2019.

Tuesday, 13th November 2018		8:30 -17:00
0. Good Morning Coffee/Tea/Juice 08:30-09:00 1. Introductions and meeting overview Welcome by Joost Carpaaij Netherlands Space Office <ul style="list-style-type: none"> • Alex Held (CSIRO)-(via videolink) Context and Objectives 		09:00 15 mins
2. Overviews of the science State-of-the-Art and EO requirements EWV focus areas (focus on requirements regarding climate and water resource management and reporting) <ul style="list-style-type: none"> • Precipitation (including snow) George Huffman (NASA) et al • Evaporation / evapotranspiration Bo Su (Un. Twente) & Gilles Boulet (CESBIO/IRD) • Soil Moisture Yann Kerr (CNES)& Rajat Bindlish (NASA) Each presenter will discuss: <ol style="list-style-type: none"> 1. the state of the science and existing database/s 2. How the science is done (protocols) 3. Existing critical observations with a focus on EO, identifying needs or gaps <small>Note : it may well be that some of the above application areas are well covered with current and future confirmed EO missions and that area requires less focus, except for cross-cutting issues.</small>		75 min. Experts 20 min presentation + 5 minute discussion
Break		10:30-10:50
2. Overviews of the science State-of-the-Art and EO requirements (Cont'd) <ul style="list-style-type: none"> • Groundwater Matt Rodell (NASA) • Surface water quality Arnold Dekker (CSIRO/SatDek) • Surface water quantity Andreas Brink (JRC) et al • Cross-Cutting TBC 		100 min. Experts 20 min presentation + 5 minute discussion
Lunch		12:30-13:30
3. End-User requirements at the global scale. From EO sensor to Decision Making: what is needed and what do we have now (incl. reference to SGD's)? <ul style="list-style-type: none"> • IGWCO • GEOGLOWS • AQUAWATCH • GEWEX 		90 min.
Break		15:00-15:20
3. Discussion session - End-User requirements at the global scale. From EO sensor to Decision Making: what is needed and what do we have now? (Cont'd)		100 min. Close ~ 17:00

Wednesday, 14 th November 2018		9:00-10:30
4. Current and Planned Observations Selected CEOS agencies to present a summary of as many EWV areas relevant to their programmes: Current and planned missions and (possible to likely) gaps incl, in Situ and Space-based observation timelines (cf. CEOS EO MIM Database) <ul style="list-style-type: none"> • Gerald Bawden (NASA) • Selma Cherchali/Philippe Maisongrande (CNES) • Jerome Benviste (ESA) • Lionel Zawadzki (EC Copernicus Land Services) • Guangming Zheng (NOAA) • JAXA (TBC) 		90 min.
Break		10:30-10:50
Current and Planned Observations Continued 5. Break –out session setup Note: Break-out groups to identify focus areas based on Science, local to global End-User requirements and CEOS agencies existing commitments to EO sensors and future plans		40 min. 60 min.
Lunch		12:30-13:30
6. Breakout session I <i>Breakout sessions will be focused on the 6 EWV focus +cross cutting areas. The meeting participants will be evenly distributed between each EWV and will have an opportunity to change EWV between sessions 8, 9 and 10 allowing participation in as many as 3 distinct EWV discussions if desired. For each EWV a lead and rapporteur (2 people team) has been designated.</i>		90 min.
Break		15:00-15:20
7. Breakout session 1 continued (15:20- 16:20) Preliminary Gap Analysis Discussion (16:30 – 17:30)		130 min.
Adjourn		17:30

Thursday, 15th November 2018	9:00
<p>8. Breakout session II</p> <p>Note: Gap analysis based on identifying via EO requirements (combination of Day 1 and Day 2 outcomes) existing and planned EO sensors where a joint agency response is required;</p>	90 min
Break	10:30-10:50
<p>9. Breakout session II (Cont'd)</p> <p>Note: Gap analysis based on identifying via EO requirements (combination of Day 1 and Day 2 outcomes) existing and planned EO sensors where a joint agency response is required;</p>	100 min
Lunch	12:30-13:30
<p>10. Breakout session III – Next steps</p> <p>Note: creation of ad-hoc working teams around identified areas where there is a need for new EO sensor systems relevant for CEOS agencies. Create a timeline plan for writing report(s), peer reviewed paper(s) and CEOS recommendations</p>	90 min
Break	15:00-15:20
<p>11. Next steps for a CEOS Freshwater from Space Strategy summary & workshop wrap-up (by workshop leads)</p>	130 min
Workshop closes	17:30