Session 2: Cross-ECV – from current to future activities, lessons learned and setting priorities for future activities

Breakout session 2d: Land-Ocean Cross-ECVs

16:45 - 17:30 • 45min • Wednesday 9/9/2020

Facilitators:

Shubha Sathyendranath, Science Lead PML (Chair)

Jean-François Crétaux, Science Lead LEGOS,

Jérôme Benveniste, Senior Advisor ESA

2d Land-Ocean Cross-ECVs:
Discussion-seeding presentations

1. Steve Groom: On the need for seamless products that serves the needs of ocean, coastal and inland water applications

2. Shubha Sathyendranath: Water-borne diseases; Fire and water

3. Jean-François Crétaux/Jérôme Benveniste: Exchanges between land and ocean of water and carbon / Deltas, floods, Sea Level Rise, storm surges

2d Land-Ocean Cross-ECVs: **SEED QUESTIONS**

1. How to further combine individual ECVs in a more system focussed approach?

2. Which cross-ECV do we want to support but need further input, both in terms of existing ECVs contribution and new ECVs?

3. Which ECVs would form natural clusters if they were organised around specific climate questions that touch upon land-ocean interactions and could facilitate benefits for society?

2d Land-Ocean Cross-ECVs: **Recommendations**

1. **How to further combine individual ECVs in a more system focussed approach?**

Answers and Recommendations:

Lakes have 5 variables (LWL, LWE, LIC, LSWT, LWLR). There is a need to combine all five (or partst) to fully understand the role of lakes as sentinels and integrators for the effects of climate change. Such analysis needs to be done globally but also at finer scale due to the variety/complexity of watersheds/landscapes

Many ECVs are interacting and should be analysed in synergy

- ocean : ocean colour, sea state, SST, SSS, sea level, waves & wind, bathymetry,....
- land: land use, land use change, topography, position of the shoreline, river runoff in estuaries, ground motion (subsidence, uplift), ...

Some of the above parameters ARE NOT in the list of ECVs considered by ESA so far (eg., bathy/topo at land-sea interface, vertical land motions, shoreline position). This should change...especially since various space data can be used to measure them.

Finally, I think that ATMOSPHERIC PROCESSES AND ASSOCIATED ECVs should be added because land-ocean evolution is strongly impacted by atmospheric fluxes and other factors (precipitation, evaporation, aerosols, clouds, composition....)

We need to address the need for seamless products that bridge ocean-coast-transitional zones-lakes-rivers domains. This requires that we address the differing needs for spatial and temporal resolutions as we transition from one domain to another.

From Anny Cazenave

As far as I understand, "**land-ocean interactions**" concern the processes occurring at the interface between these 2 compartments of the Earth system,

hence coastal zones (**land-sea interface**).

To me, responses (but rather questions) to **question 3** could be:

How coastal zones (land-sea interface) evolve in time and space under *natural* (climate change, weather extremes –floods, storm surges-, tectonics, sea level rise, etc.) and *human- induced* (pollution; urbanization; sand, water & oil extraction; land use; land use change; dam building on rivers; etc.) *forcing factors*?

What are the consequences for society? (e.g,, water quality and impacts on human health, shoreline erosion and retreat, salinization of land and impacts on agriculture and food security, destruction of ecosystems, etc.)

Thus, obviously **many ECVs are interacting and should be analyzed in synergy** for monitoring, process understanding, adaptation and mitigation (response to **question 1**):

- **Ocean: ocean color, sea state, SST, SSS, sea level, waves & wind, bathymetry,....**

- **Land: land use, land use change, topography, position of the shoreline, river runoff in estuaries, ground motion (subsidence, uplift)...**

Some of the above parameters **ARE NOT in the list of ECVs considered by ESA** (e.g., bathymetry/topography at land-sea interface, vertical land motions, shoreline position). This should change...especially since various space data can be used to measure them

Finally, I think that **ATMOSPHERIC PROCESSES AND ASSOCIATED ECVs** should be considered because land-sea evolution is strongly impacted by atmospheric fluxes and other factors (**precipitations, evaporation, composition**....)

2d Land-Ocean Cross-ECVs: **Recommendations**

2. **Which cross-ECV do we want to support but need further input, both in terms of existing ECVs contribution and new ECVs?**

Answers and Recommendations:

Cross ECVs: Aerosol, clouds, SST, ocean colour, sea level, salinity, sea ice

New ECV: Solar radiation at the sea surface (Surface Radiation Budget). For biological applications, need to know spectrally-resolved radiation in the visible domain as well as the UV and infra-red components

Lakes and Glaciers: there are clear interactions between the two ECVs (new lakes, change in lake colour/size/level) but some lakes in the alpine environments (Alps, Himalaya, Andes) (where we do have glaciers with impressive retreat) are not mapped (mostly because limits in spatial resolutions, observation issues related to the relevant orography, etc)

Note: Land-ocean interactions are not limited to the coastal and transitional zones. Some of the examples shown (water-borne diseases; ash from fire fertilising the oceans) indicate that the connections go beyond the coastal domain to the open ocean, and reach across ocean basins.

2d Land-Ocean Cross-ECVs: **Recommendations**

3. **Which ECVs would form natural clusters if they were organised around specific climate questions that touch upon land-ocean interactions and could facilitate benefits for society?**

Answers and Recommendations:

Answer would depend on the question asked:

Question: Effect of increased fire on aerosols and oceanic primary production. ECVs required: Aerosol, Fire, ocean colour

Question: Flux of material between land and ocean: ocean colour, sea level, lake level

Question: Human health and water: ocean colour, precipitation, salinity, SST soil moisture

Question: Carbon cycle: Lakes, Permafrost, GHG, fire, LST, Ocean Colour, LLC/HRLC, Aerosols.

Question: land-atmosphere-ocean interactions: SST, Soil Moisture, LST, LC7HRLC, Lakes, Sea State, SSS, Biomass.

Question: Evolution of coastal zones (land sea interface) evolve in time and space under natural (climate change , weather extremes, tectonics, sea level rise, etc) and human- induced (pollution, urbanization, sand , water & oil extraction, land use, land use change, dam building on rivers, etc.) forcing factors.

Question: Societal impact (e.g., water quality and impacts on health, shoreline erosion and retreat, salinization of land and impacts on agriculture and food security, destruction of ecosystems, etc.

More comments

Shubha: Radiation

Carsten: Precipitation

Carbon in the Arctic: tDOM is a good indicator... Done in Baltic Sea

Marie-Fanny: Sea ice cover and snow melt in arctic region ... Fresh water and nutrient input.

Cloud Cover => influence on plankton ... (in the Atmosphere-Ocean Breakout

2d Land-Ocean Cross-ECVs: **Recommendations**

Epilogue:

- To fully respond to these seminal questions and make exhaustive recommendations to CCI, we need a full-blown workshop at international/global level