WG1	WG2	WG3
Chair: Mark Buehner Secretary: Steffen Tietsche	Chair: Anne O'Carroll Secretary: Tony Mc Nally	Chair: Chris Merchant Secretary: Phil Browne
Large Committee Room (We, Thu)	Meeting Room 1 (Wed, Thu)	Mezzanine Room (Wednesday) Council Chamber (Thursday)
Observations and Methods processing chains	Downstream Applications of SST and sea ice	Observations and Method processing chains
Frozen (Sea ice)		Unfrozen (SST)

- What are the possible visions (10 years) for SST and sea ice information at ECMWF?
- What recommendations would you make to space/observations agencies ?
- Which observations (& what level) should drive the evolution of our systems?
- What should be the next steps to improve SST and sea ice in NWP and reanalysis?
- What are the current gaps future barriers (observations, forward models, DA, etc)?

WG2: Processing Chains and Downstream applications for SST and Sea-Ice

Participants

Chair: Anne O'Carol Rapporteur: Tony McNally

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Adrian Simmons
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Mattias Drusch
Dinand Schepers
Simon Good,
Lothar Schuller

High level strategy – CM/DA is very exciting!

- An evolution towards level-1* data usage has benefits that should be followed unrelated to CDA (similar to atmosphere DA moving to VAR)

- CDA and modelling has demonstrated benefits that should be followed (unrelated to the use L1)

- Fully coupled L1-DA is aspirational, but at this stage speculative and a stepwise approach needs to be followed as science and resources allow (and needs to consider wider aspects such as the land / composition / hydrology)

- Related to this we need to evaluate if separate wave model and ocean model and ice model is fit for this purpose (same for DA)

- Seek to exploit opportunities, campaigns and collaboration (SAFs, ESA, EUMETSAT, all existing partnerships, GHRSST)

Near term opportunities (in view of BOND)

- **Timeliness**: Delivery of daily product SST/ice a few hours earlier (to make 00z cut off would help), possibly a daily product twice per day ?

- **Spatial scale**: ECMWF can investigate existing prototype OSTIA product (that has reduced filtering) for sensitivity/impact.

- **Time sampling**: Limited time sample information possible with LEO satellites at night (GEO, in situ helps, but minority)

- **Information accuracy**: difficult to quantify, EC need to define / / feedback sensitivities (random/drift/gross) and present to GR workshop.

- **Scope and metadata** (errors) EC should use more QC information supplied with product.

What steps development does ECMWF have to undertake to make significant progress?

Improved atmospheric, ocean, ice, wave modelling to allow coupling (skin temperature, boundary currents, ice processes, ocean mixing, atmospheric model errors, particular attention to systematic errors and missing processes)

Technical and scientific DA developments (observation operators / jacobians / covariances) to allow a framework for various degrees of coupled DA using a wide range of observation types.

Handling of clouds / aerosol for SST information and microwave emission properties frozen surfaces, use of SCAT data (currents/stress/ambiguity)

What recommendations would ECMWF make to space and other observations agencies to assist development ?

- Support coupled RT science development for the sensors they plan to launch (currently fly and have previously flown).
- Provision of appropriate RFI protected passive microwave (pixel size 10-15 km and e.g. frequency including C-band)
- Dissemination of a mixed L1/L2 product (sea and ice) would be a valuable support of long term evolution. A product currently exists that could be used as a prototype
- Support recovery / reprocessing / climate standard homogenisation of operational and historical data (including QC / meta data / format) for this application CDA (satellite and in situ)
- In CDA the ocean / sea ice observation network becomes and integral driver of operational forecast skill (and climate monitoring) and thus need the similar levels of coordinated protection and governance as atmospheric networks to ensure it is fit for this purpose.
- Both satellite and in situ networks must have appropriate support of reference / calibration standard data

Particular issues for reanalyses

- ERA 6 will be based on a tried and tested operational NWP system. Timings and plans for the degree of coupling (based on issues in the extra tropics) need to confirmed in good time.

- C3S CMEMS dialogue and coordination to optimise use of OSTIA SST / ice information.

- In the spirit of moving to CDA the framework and support for ocean reanalysis should be on a level consistent with the atmospheric reanalyses.

Spare slides

What are the current deficiencies & gaps, and future barriers (observations, forward models, DA, etc)?

Provision of appropriate RFI protected passive microwave (pixel size 10-15 km and e.g. frequency including C-band,

Sufficient coverage/revisit time of all satellite data to constrain analyses.

Handling of clouds / aerosol for SST information and microwave emission properties frozen surfaces, use of SCAT data (currents/stress/ambiguity)

Model: (skin temperature, boundary currents, ice processes, ocean mixing, atmospheric model error)

What are levels of data should drive development

Technical / science issues related to a fully coupled system are significant.

Initial weakly coupled (outer loop) will use L2++

In parallel develop jacobian facility to passively monitor L1 data (NCEP approach)

All aspects of RT (atmosphere / surface) need improving, but the concept of coupled RT needs to be considered (targeted at instruments / frequencies)

Need significant and urgent support to improve emission modelling across MW frequencies over frozen surfaces (space agencies).

Motivation to move to fully coupled system / L1 (over coupling for FC)

Passive IR (atmosphere), SW / NIR

Passive MW (ocean emissivity / roughness / snow / ice)

SCAT data interpretation

Altimeter interpretation

Model process development