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WP3: Quality assessment of CCI products

Pablo Ortega
Earth Sciences Department (BSC)

cmug cci

WP3.4 Propagation of CCI(+) observational uncertainties to climate model scales

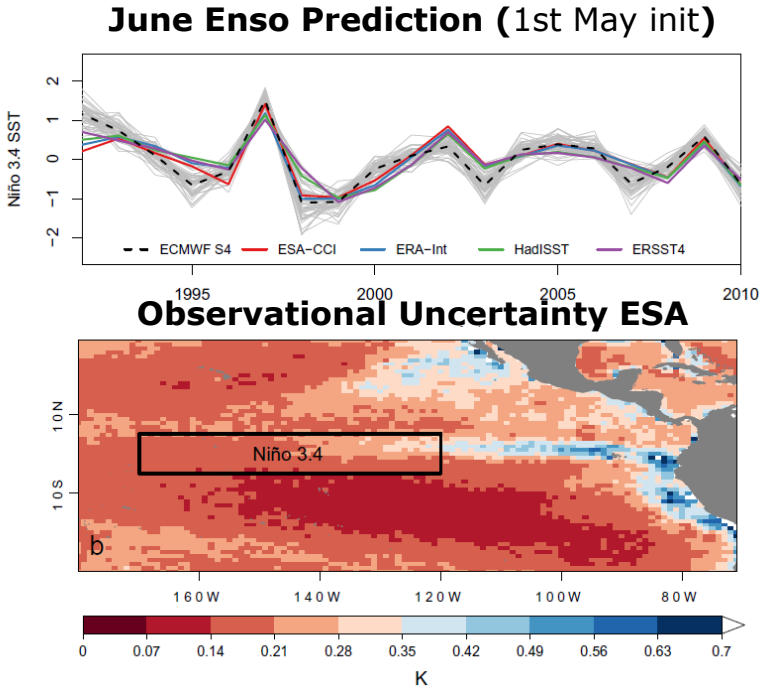
Background and rationale:

Uncertainties in climate models and observational references have been assessed thoroughly in the past. However, it has remained difficult to integrate these because of the lack of formal concepts that characterize uncertainties at common scales to both models and observations.

A first framework to perform this was developped in CMUG-CCI for SSTs.

People involved: Louis-Philippe Caron
Etienne Tourigny

Bellprat et al, 2018



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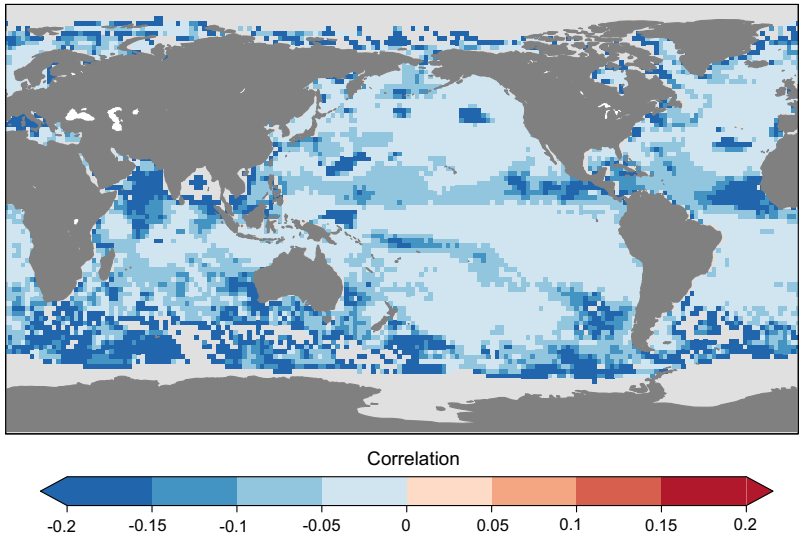
Bellprat et al, 2018

Lost skill due to total observational uncertainty



WP3.4 Propagation of CCI(+) observational uncertainties to climate model scales

Plans to work with CCI+-ECVs:

Expand to other ECVs relevant to study wild fires:

- Old ECVs: **fire** (burned area), soil moisture
- New ECVs: land surface temperature

Interaction with relevant teams:

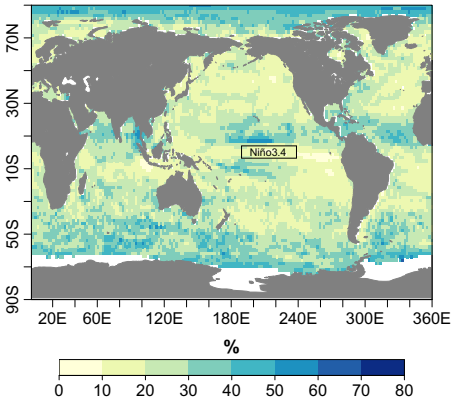
- Attendance to next Fire CCI meeting
- Emilio Chuvieco collaborator of Etienne's MSCA on wild fires
- Participation to Meetings/regular telcos

Consistency between ECVs:

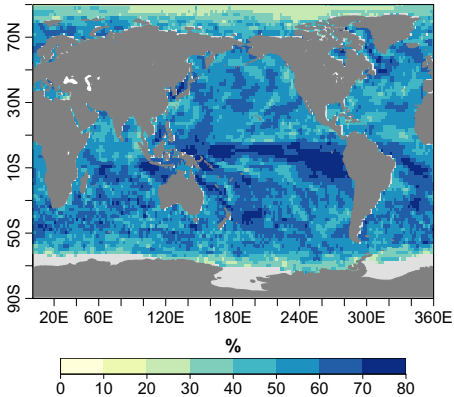
- New metric to assess consistency across at least 4 variables (SST, fire, soil moisture, LST)
- Compare in each the importance of record length vs observational uncertainty

Bellprat et al, 2018

Observational Uncertainty



Record Length Uncertainty



WP3.4 Propagation of CCI(+) observational uncertainties to climate model scales

Bellprat et al, 2018

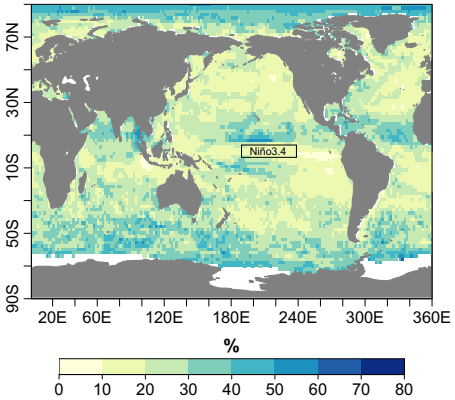
Use of uncertainties:

- The observational error is required to compute the interpolation errors in space/time (which need a finite correlation length and correlation time scale)
- For case studies on prediction, we will quantify two additional sources of uncertainty, due to the record length and to the ensemble size.

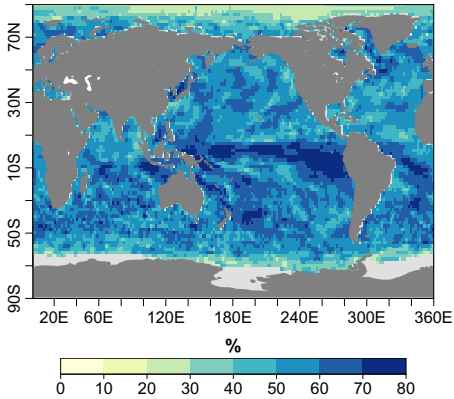
Mechanisms to provide feedback to ECV teams

- Regular channels: (e.g. Participation to Meetings/ telcos)

Observational Uncertainty



Record Length Uncertainty



WP3.7 Evaluation of the impact on skill of an enhanced SIR on seasonal prediction

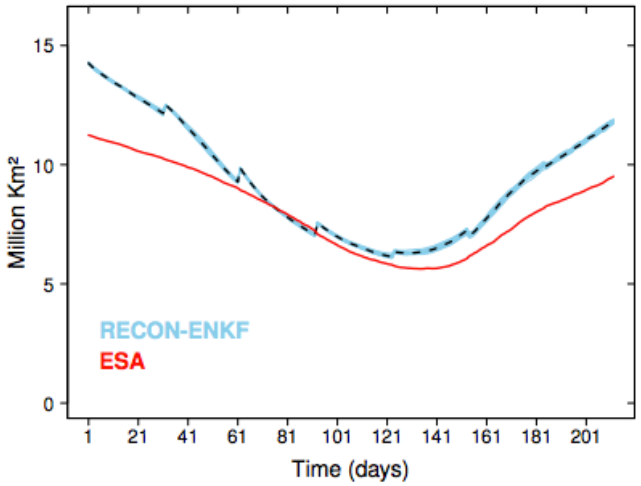
Background and rationale:

The analysis of a previous reconstruction of sea-ice performed within the CMUG-CCI has highlighted that the accuracy of assimilation can be limited by the uncertainty of the assimilated products, and also by the frequency of each assimilation phase.

People involved: Pablo Ortega
Juan Acosta
Rubén Cruz-García

Cruz-García et al, In Prep.

Pan-Arctic Sea Ice Extent
May through October



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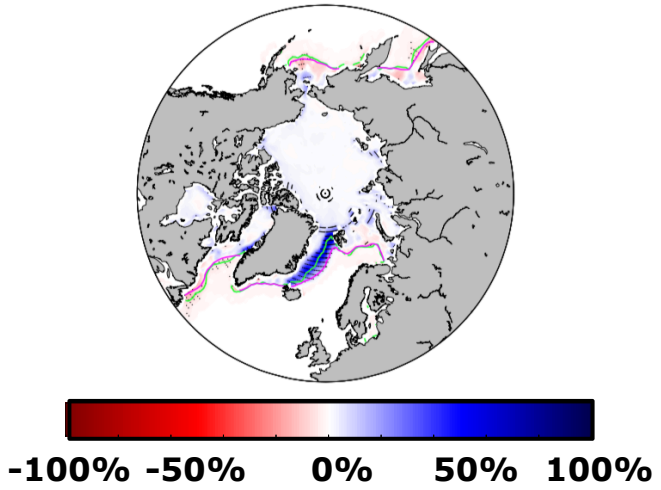
Sea Ice Concentration Difference
Recon-ENKF vs ESA (1st May)



WP3.7 Evaluation of the impact on skill of an enhanced SIR on seasonal prediction

Plans to work with CCI+-ECVs:

- Directly assimilated: **SIC**
- Nudged: SST (to be considered)
- Analyses: SIT, clouds and potentially salinity

Interaction with relevant teams:

- Regular channels: (e.g. Participation to Meetings/telcos)

Consistency between ECVs:

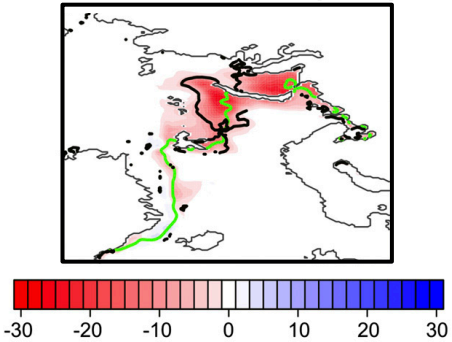
- Forecast evaluation against other CCI products (such as SST, SIT and Clouds)
- Testing if skill is improved when CCI SIC/SST data is included in the ICs.

García-Serrano et al, 2014.

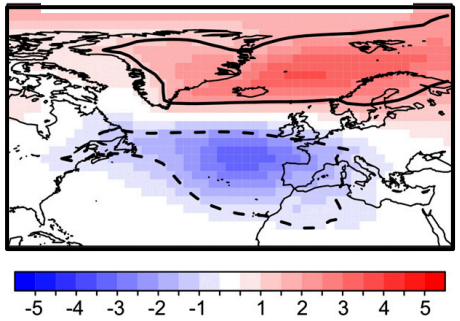
Expected outcomes:

Improved skill over the Arctic and beyond

1st EOF of November Sea Ice Cover (SIC)



Predicted DJF Sea Level Pressure



WP3.7 Evaluation of the impact on skill of an enhanced SIR on seasonal prediction

García-Serrano et al, 2014.

Use of uncertainties:

- The observational error is a required input for the ENKF Assimilation
- Uncertainty will be addressed in the forecast evaluation by comparing with other observational products available

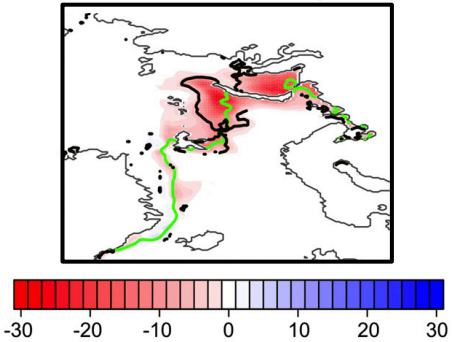
Mechanisms to provide feedback to ECV teams

- Regular channels: (e.g. Participation to Meetings/telcos)

Expected outcomes:

Improved skill over the Arctic and beyond

1st EOF of November Sea Ice Cover (SIC)



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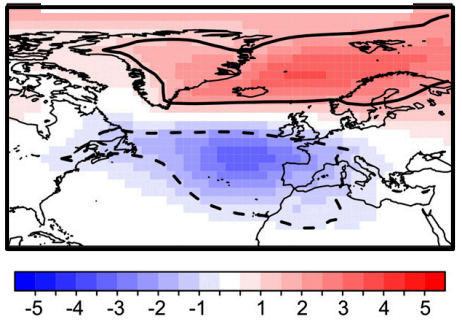

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Description of WP 3.10 and 3.11

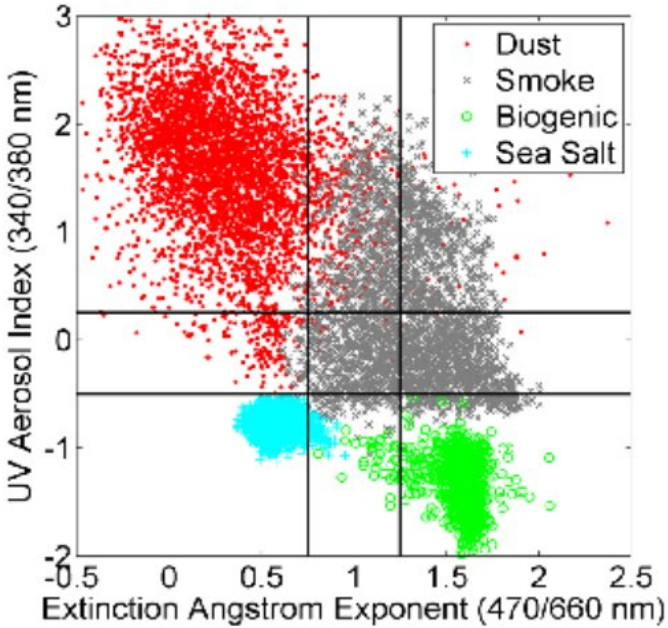
Enza Di Tomaso, Martina Klose, Carlos Pérez García-Pando
Barcelona Supercomputing Center

cmug
cci

WP 3.10 & 3.11 - Motivations

Current aerosol (and dust) data assimilation is mainly based on retrievals in the visible part of the electromagnetic spectrum, and with no information on aerosol speciation

IASI dust retrievals have the potential to overcome these drawbacks. A previous CCI case study made by BSC showed the potential of IASI for dust DA but with a few important limitations.

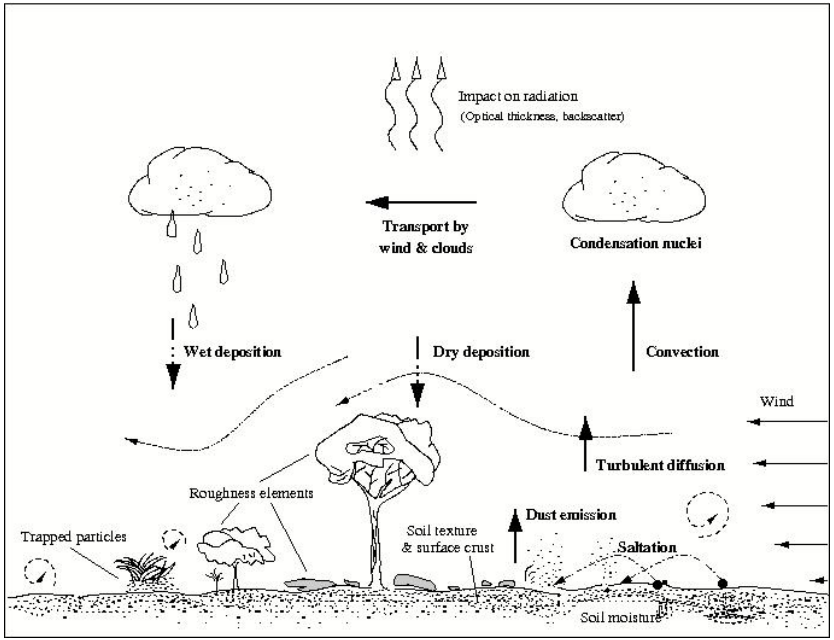


(Vries et al., 2015)

WP 3.10 & 3.11 - Motivations

Current use of Land Cover information in dust models is provided at a coarse resolution and is related to green vegetation only.

Surface characteristics are important for dust emissions



(Knippertz et al. 2014)

WP3.10: Assessment of the potential of CCI/CCI+ data to constrain mineral dust simulations at the regional scale

ECVs involved: Aerosol dust and High Res LC

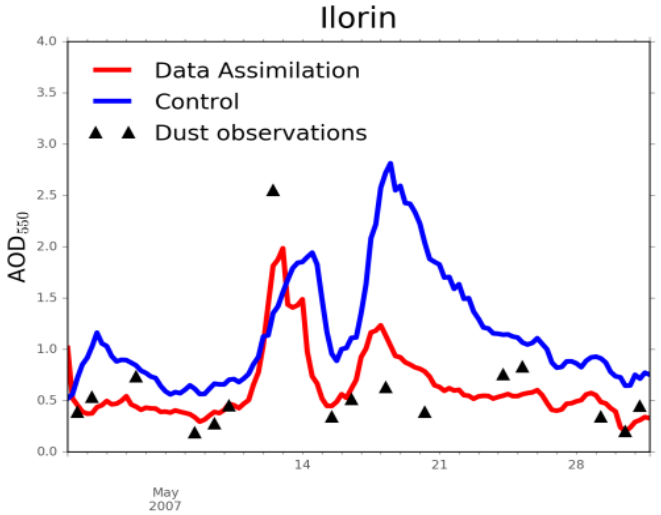
CCI IASI dust data will be assimilated in model simulations, while CCI+ high resolution land cover data (once data will become available) will be used to enhance the NMMB-MONARCH's land use type, with a consequent impact on dust emissions

WP 3.10 - Aims

Aims:

- demonstrating the use of CCI/CCI+ data to produce **dust analyses** at the regional scale;

- assessing the **synergy of CCI aerosol** data (in particular when constraining atmospheric concentrations over dust source areas) **with CCI+ land cover** data (used for an enhanced characterization of dust emissions);



- set the **basis** for the assessment activity 11 on the production **of a pilot dust reanalysis**, where the impact on dust cycles at different temporal scales will be evaluated;

- providing **feedback on these ECVs** to the ESA CCI/CCI+ teams.

WP3.11: Production of a pilot dust reanalysis at the regional scale

ECVs involved: Aerosol dust and High Res LC

CCI IASI dust data will be assimilated in model simulations for the reanalysis period. Simulations will make use also of CCI+ high resolution land cover data, once these will become available, in order to enhance the NMMB-MONARCH's land use type.

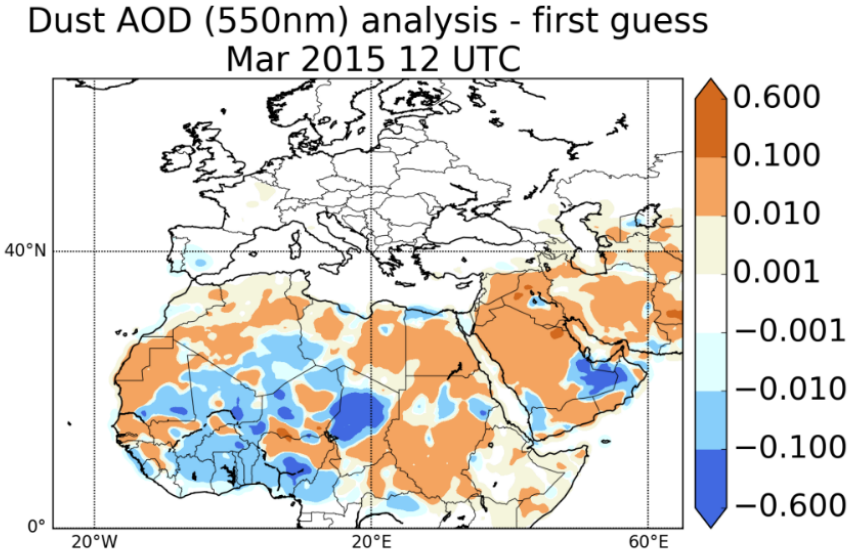
WP 3.11 - Aims

Aims:

- producing **a pilot dust regional reanalysis** based on CCI/CCI+ data, over a 1 year period

- detection of **systematic (spatial and temporal) patterns of data impacts** on the dust analysis through statistics of innovations

- assessing whether their integration in model simulations can improve the **monitoring of mineral dust** and the characterization of **dust cycles**



WP 3.10 & 3.11 - Interactions

Planned interactions:

- CCI+ ECV teams: LC, HRLC teams

Initial discussions: domain, variable values&types, temporal resolution, period, format

- CCI ECV teams: email discussion started with ULB (C3S ECV)
- External:
  - DustClim consortium (dust reanalysis)
  - WMO SDS-WAS hosted by BSC/AEMET

DustClim ERA4CS European Research Area for Climate Services

Links within CMUG: Aerosol global reanalysis (ECMWF)

WP 3.10 & 3.11 – Expected outcomes

A data assimilation/modelling assessment of CCI/CCI+ data will be of added value to the standard CCI experiments as it will provide a **different perspective to the evaluation efforts**, and will allow to **assess ECVs for cross-consistency**.

A reanalysis assessment is able to showcase the potential of CCI/CCI+ data to contribute to the formulation of **management and mitigation plans of different socio-economic sectors**. A dust reanalysis in particular can be used to provide resources for studying the impact of dust on **health, weather and climate**.

BSC's strong **links to specific user communities** through its **WMO SDS-WAS** activities can guarantee the visibility of such potential for the data considered.

Additional slides

WP 3.10 & 3.11 - Motivations

Currently used in MONARCH (BSC model):

Land cover type:

- Meteorological component estimates aerodynamic roughness length (z0) based on USGS 94-category land use and regionally (N Africa and Asia) uses 1/4x1/4 degree resolution z0 based on POLDER-I (Laurent et al. 2008)

(Green) Vegetation cover fraction:

- The meteorological and land-surface component uses USGS monthly climatology at 1km resolution

- The dust module uses MODIS LAI at 0.1x0.1 degree resolution, at a monthly variation, and available for 2000-2015

  - to calculate a drag partition to correct the threshold friction velocity for sediment mobilization
  - to estimate the erodible (bare) area for dust flux calculation
  - [optional] to scale dust flux

WP 3.10 - Actions

Actions:

- processing IASI dust aerosol data to follow the assimilation cycles
- implementation of an observation operator for the thermal infrared
- identifying optimal assimilation settings for observation error statistics and covariance localization
- implementation of the use of CCI+ high resolution land cover to characterize the model land type
- DA simulations on a regional domain covering Northern Africa, Europe and the Middle East for specific dust events (usually lasting 1 to 10 days) during the active dust season
- assessment of the impact of assimilating the data during relevant dust events and validation with independent observations

WP 3.11 - Actions

Actions:

- production of a pilot reanalysis over the course of a specific year characterized by relevant dust events
- statistical analysis of innovations throughout dust cycles at different temporal scales
- reanalysis validation with independent observations
- comparison of the dust reanalysis with other reanalyses

WP 3.10 & 3.11 – Scientific questions

Scientific questions:

- Which is the added value of assimilating thermal infrared retrievals?
- Which is the impact of IASI data assimilation at the regional scale in high resolution simulations?
- Are CCI (pixel-level) uncertainties realistic?
- Does enhanced land type information improve the first-guess of mineral dust tracers, and consequently dust analyses?
- Are the used CCI/CCI+ ECVs consistent?
- Can CCI/CCI+ data improve aerosol reanalysis?
- Can CCI/CCI+ data improve in particular the characterization of dust cycles?
- How well does the regional dust reanalysis compare to global reanalyses?

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WP4: Exploiting CCI products in MIP experiments

Pablo Ortega
Earth Sciences Department (BSC)

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WP4.7 Evaluation of probabilistic and deterministic skill in decadal predictions

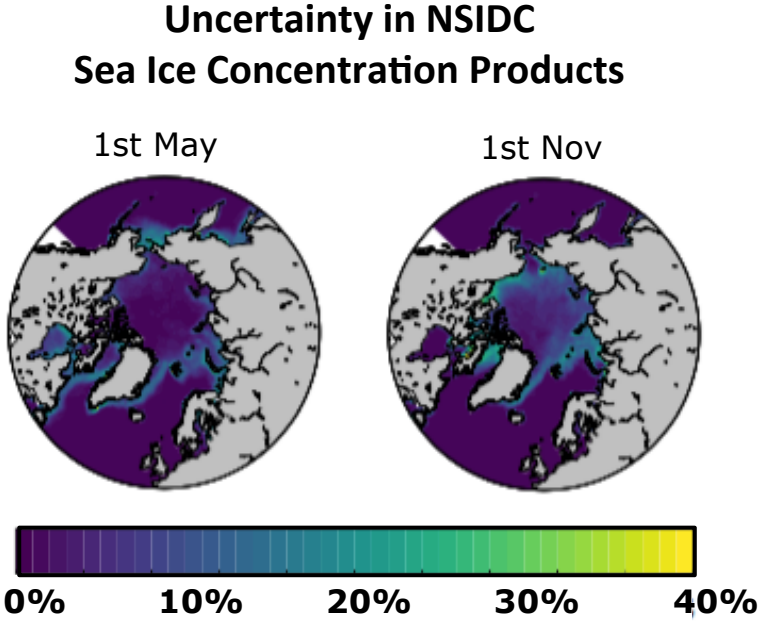
Background and rationale:

A rigorous assessment of prediction skill requires climate predictions to be evaluated against different observational datasets, preferably independent from those used for initialization.

This is important to reflect the observational uncertainty, and the degree of coherence among the different products.

People involved: Louis-Philippe Caron
Simon Wild

Cruz-García et al, In Prep.



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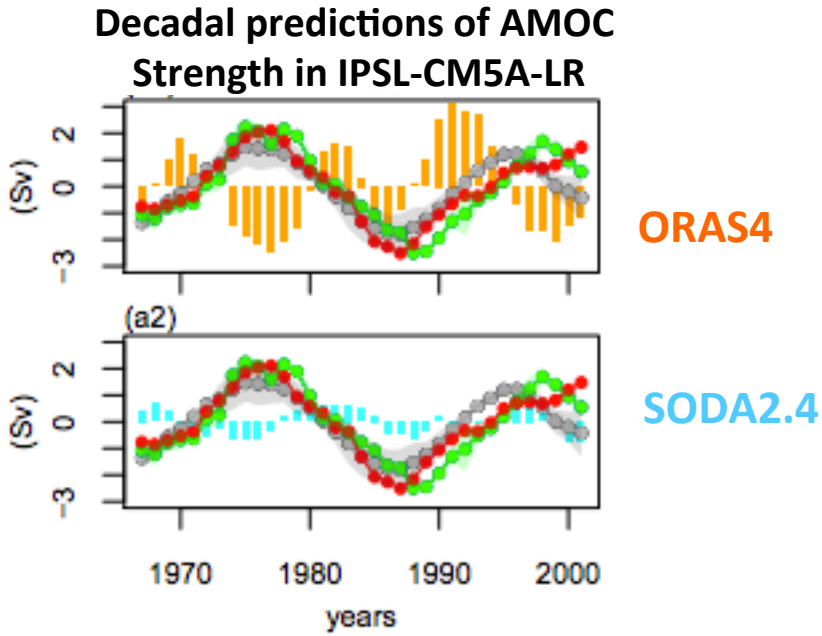
Mignot et al 2016



WP4.7 Evaluation of probabilistic and deterministic skill in decadal predictions

Plans to work with CCI+-ECVs:

Multi-model extensive skill assessment of the DCPP predictions against longest CCI products

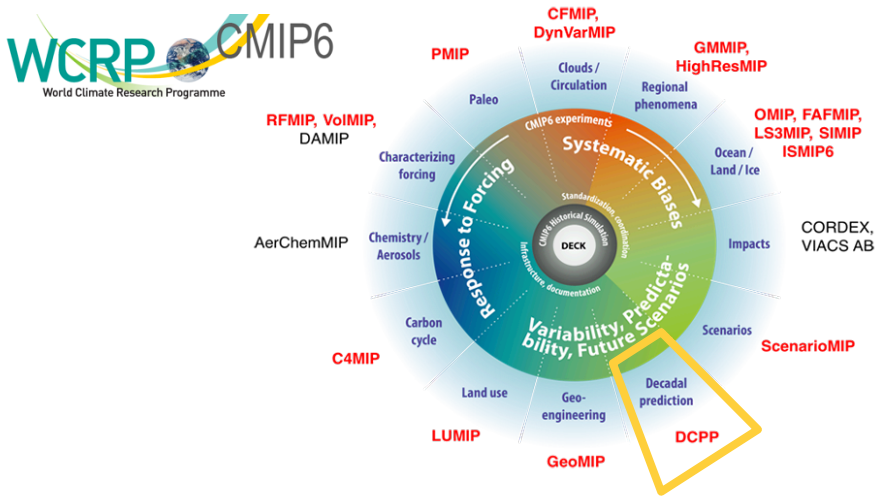
- CCI ECVs: Sea Level, SST and Clouds
- Other products more than 20 year long?

Interaction with relevant teams:

- Regular channels: (e.g. Participation to Meetings/telcos)

Consistency between ECVs:

- Focus on regions and indices for which skill is expected to be consistent for the selected variables (e.g. tropical areas, ENSO)
- CCI products as independent validation source to test consistency with initialization datasets



DCPP Component A:
Retrospective Predictions [1960-2017]

DCPP Component B:
Near-real time Forecasts [2018 onwards]

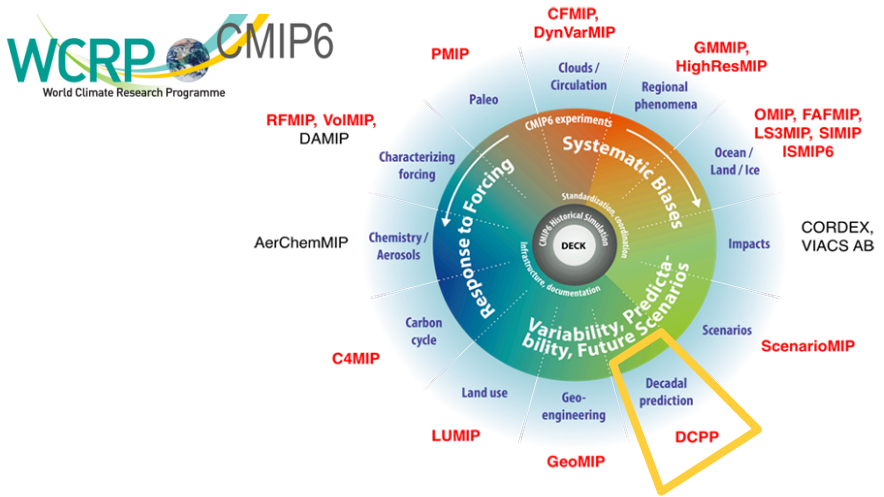
WP4.7 Evaluation of probabilistic and deterministic skill in decadal predictions

Use of uncertainties:

- Uncertainties in the predictions will be illustrated through the use of probabilistic skill metrics, and by evaluating them against different reference datasets

Mechanisms to provide feedback to ECV teams

- Regular channels: (e.g. Participation to Meetings/telcos)



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