Introduction

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THE STRENGTH OF A COMMON GOAL

ECMWF's purpose is to develop a capability for medium-range weather forecasting and to provide such weather forecasts to the Member and Co-operating States

ECMWF is complementary to the National Meteorological Services and works with them in research, numerical weather predictions, supercomputing and training.

≋ECMWF   EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

ECMWF 2016-2025 strategy: overview

Forecast targets by 2025:

- Ensemble predictions of **high impact weather** up to two weeks ahead
- Seamless approach, aiming towards predictions of **large scale patterns and regime transitions** up to four weeks ahead and **global-scale anomalies** up to a year ahead

Research goals by 2025:

- Research at frontiers of knowledge
- Ensemble-based analyses and predictions that raise the international bar for quality and operational reliability reaching a 5 km horizontal resolution

Together - More collaboration:

- Partnering with National Met Services, universities and research institutes (OpenIFS)
- Pooling expertise to improve scalability

Continued support:

Dedicated HPC, software, and data resources for Member States
Advanced training

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Horizontal resolution upgrade (March 2016 – CY41R2)

Grid res.	HRES	ENS LegA LegB/M'ly	4DV inner loops 1st 2nd 3rd			Outer	EDA 1st 2nd	
128 km			TL255	TL255	TL255		TL159 → TL191	TL159 → TL191
64 km	41r1 ⬇ 41r2	TL319		TL319		TL399		
32 km		TL639 → TCo319			TL399			
16 km	TL1279	TCo639 (D10 → D15)				TCo639		
9 km	TCo1279							

Holm et al., ECMWF Newsletter 147

A comparison of ICON & IFS for kilometre scale simulations of the tropical Atlantic

1, 2.5, 5, ~ 9 km simulations for 11.08.2016

Total water + ice content
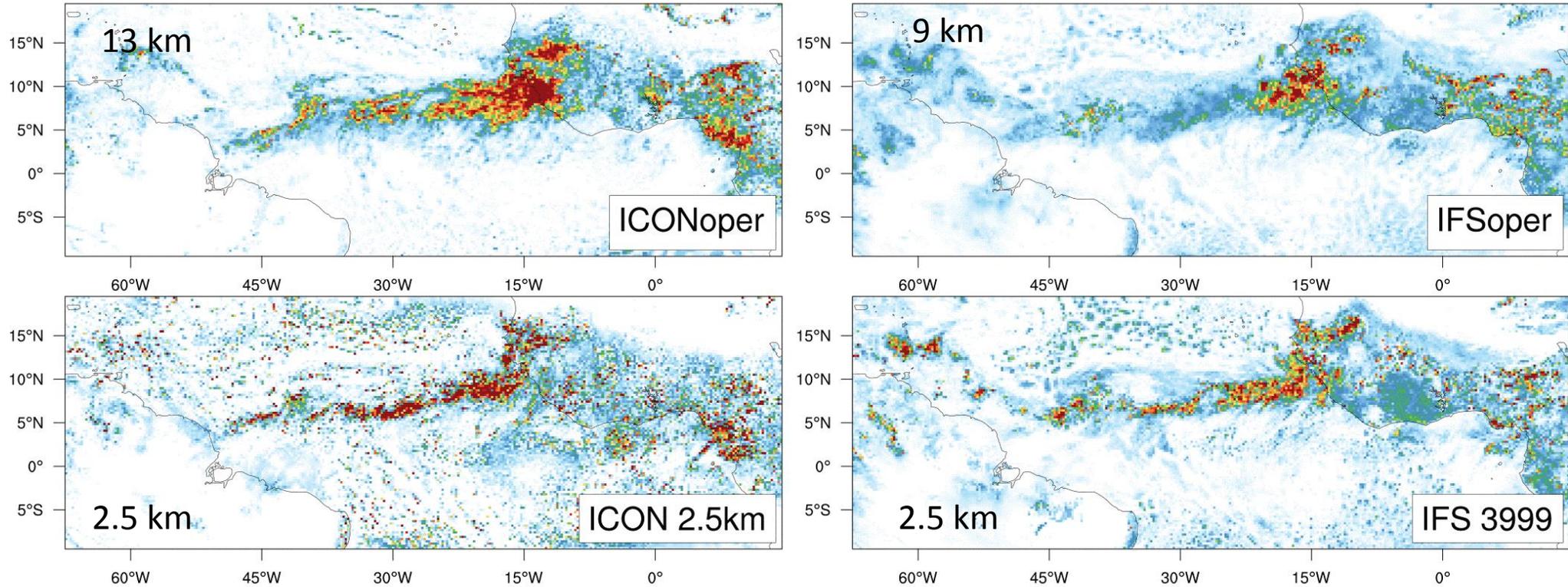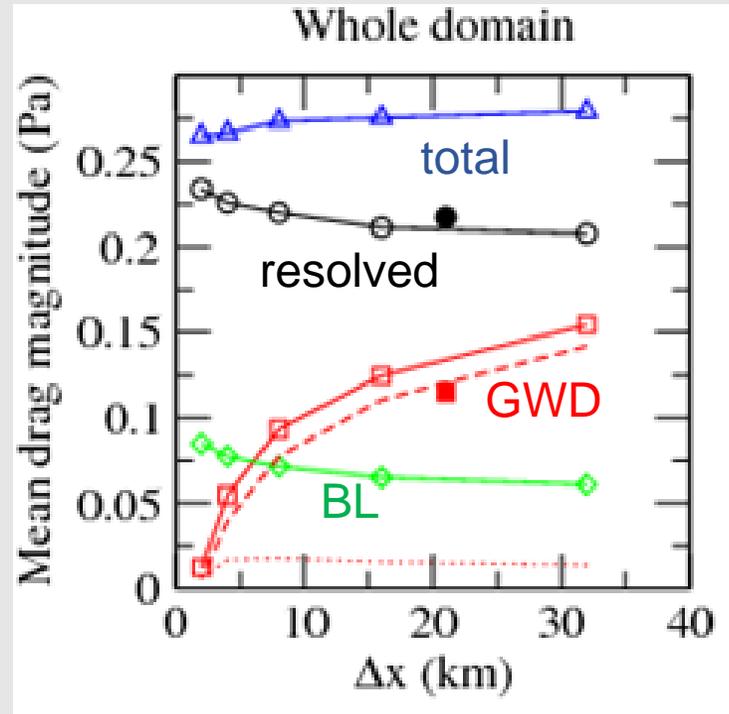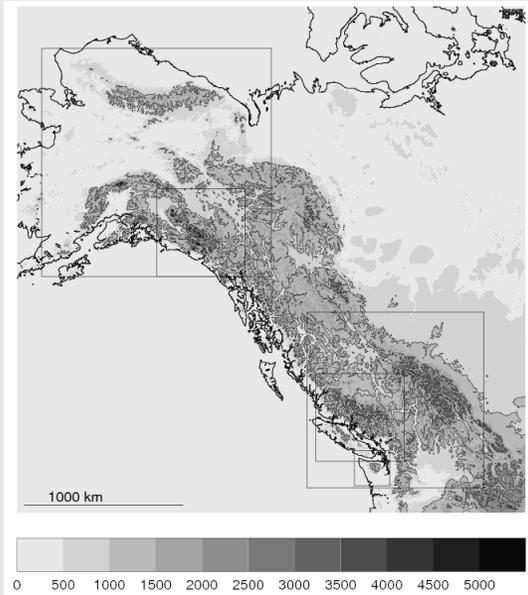
Grey zone of orographic drag for complex mountain chains – UM & IFS

Rockies (UM)

Himalayas (UM)

Change in U (m/s)

Vosper et al., in preparation
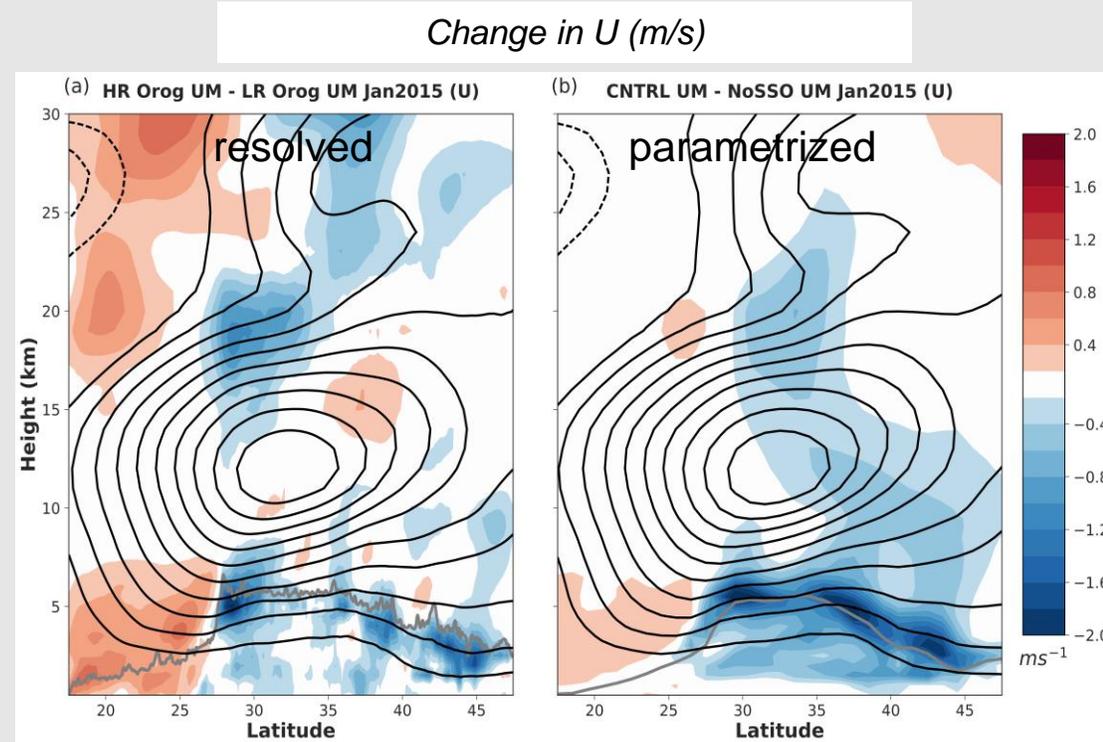
*Van Niekerk et al., in preparation*

CY45R1 Ocean Coupling in HRES
(full coupling tropics; partial coupling extra-tropics)

Forecast improvements at Day+5 (**1 year**) (blue colors indicate RMSE reduction) due to the HRES coupling of the NEMO+LIM Ocean and sea-ice model to the atmospheric model integrations

Evaluated on one full year of TCo1279 daily forecasts (April 2015-March 2016).
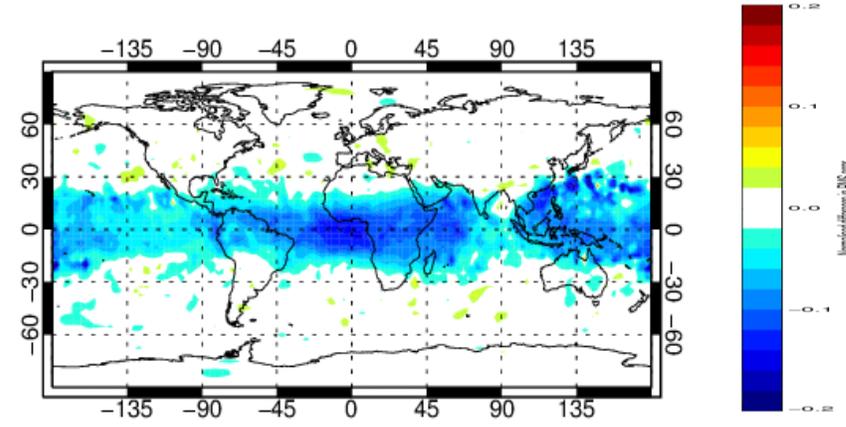
Largely positive in Tropical regions. Guinea Gulf demands attention (feedback w. stratocumulus region *)

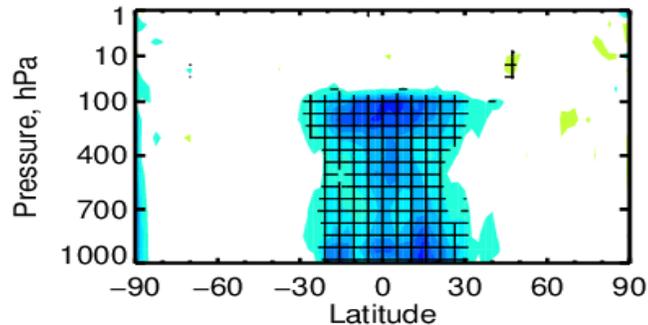*HRES MSLP improvement from Ocean-coupling*
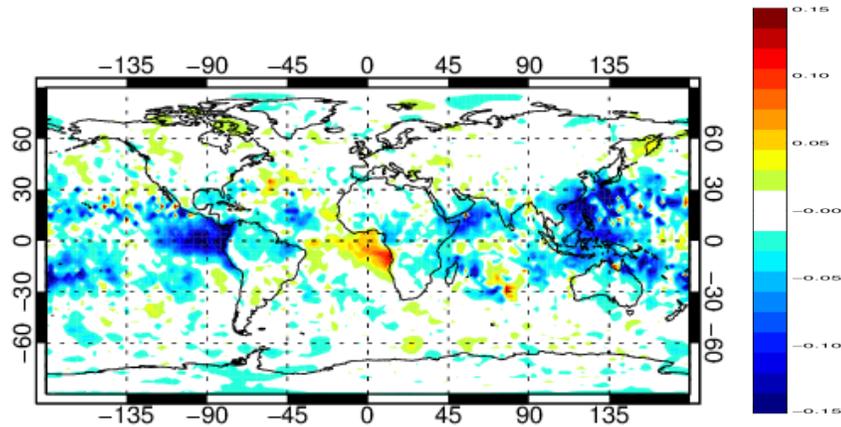
T+120

Tropics pressure about 5-10 % (*)

HRES Z500 improvement from Ocean-coupling
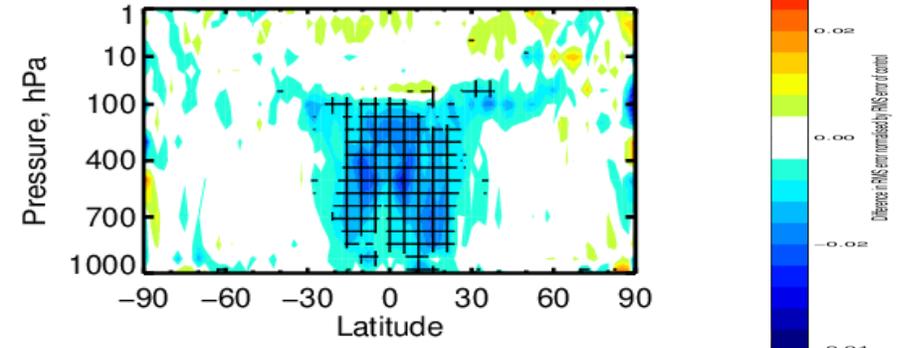T+120; 500hPa

Tropics Z500 about 5-10 %

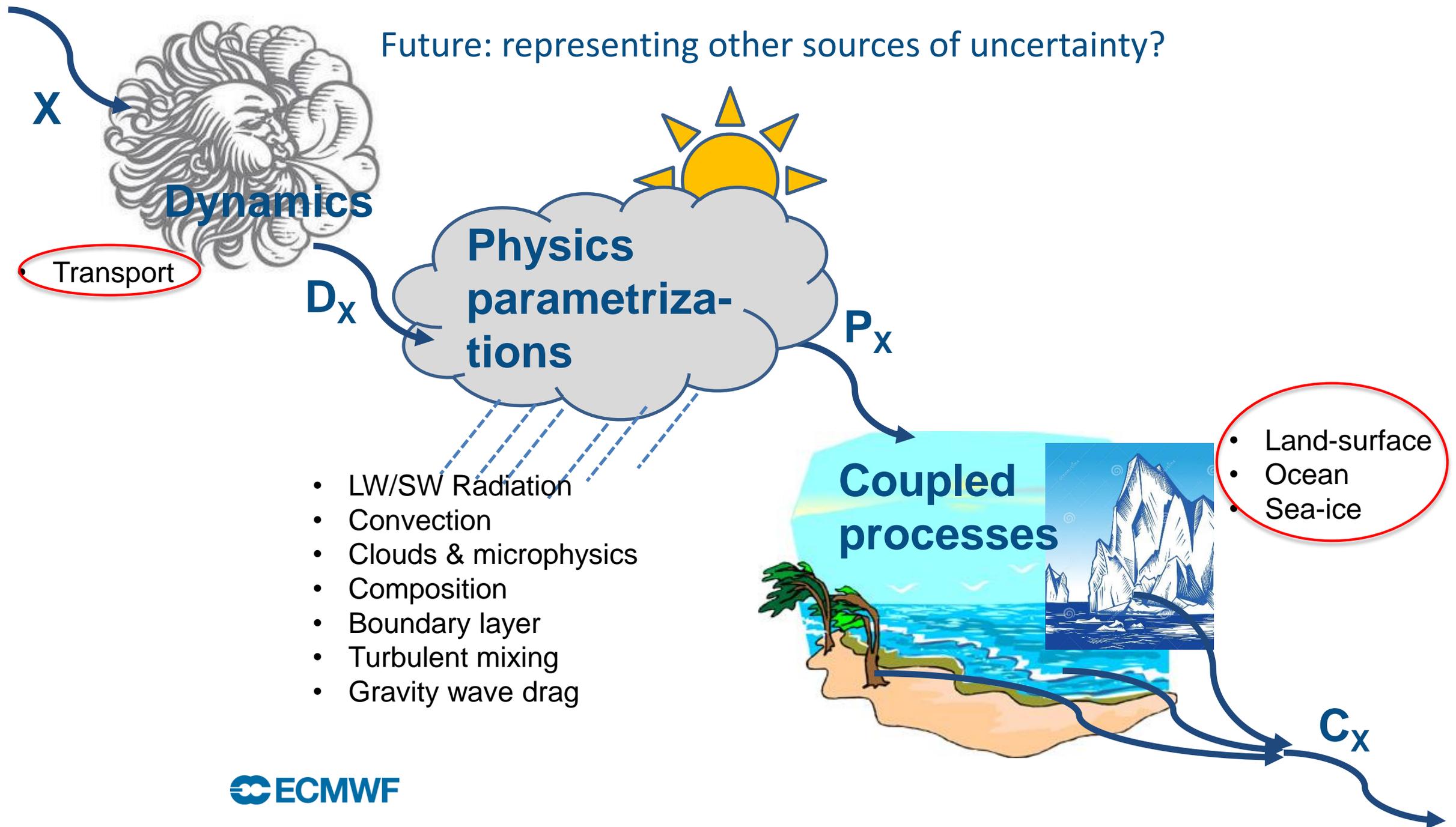*HRES Winds improvement from Ocean-coupling*

T+120

Tropics winds 2-4 %

HRES Relative Humidity improvement from Ocean-coupling

T+120

Tropics humidity 2 %

ECMWF
Kristian Mogensen & CP

Future: representing other sources of uncertainty?

X

Dynamics

Transport

D_X

Physics parametriza-tions

P_X

- LW/SW Radiation
- Convection
- Clouds & microphysics
- Composition
- Boundary layer
- Turbulent mixing
- Gravity wave drag

Coupled processes

- Land-surface
- Ocean
- Sea-ice

C_X

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Some questions……

- What have we learned from a decade or more of regional modelling in grey zones? Are there general approaches or is everything process, case and model dependent?

- Is the traditional splitting approach in term of Dynamics versus (traditional) Physics still valid in the grey zones or do we need to think differently?

- Is km-scale land-surface heterogeneity a fundamental but solvable problem ? What can we learn from regional modelling in complex terrain and can it help us constrain parametrizations at the global scale?

- What is the evidence that NH dynamics matters for global weather and climate prediction in the greyzone ?

- How do stochastic parametrizations need to evolve with increasing resolution in the greyzone ? Are existing concepts adequate for the 1km-10km range ?

- Greyzone global models are not cheap - what are the computational/scalability opportunities and constraints when moving towards these resolutions ?

- How to make more systematic progress? Test cases?