Max-Planck-Institute for Meteorology

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Progress in ICON Physical Parameterization

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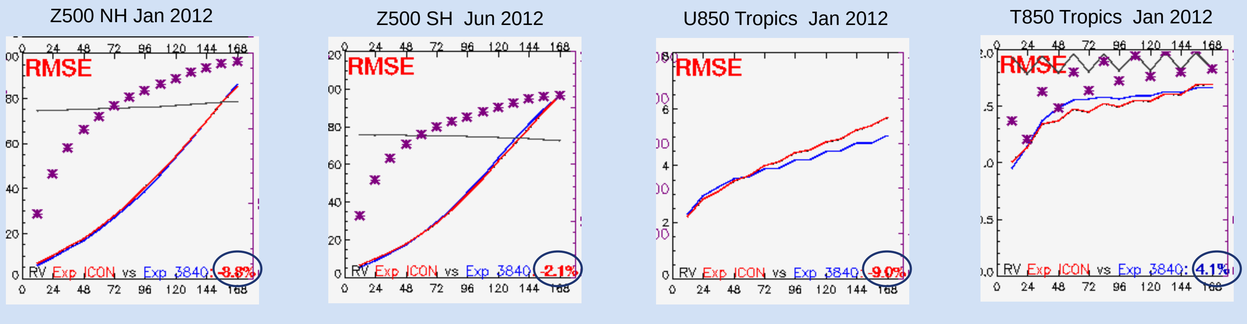
SUMMARY

- ICON physics package assembled from COSMO, ECHAM and IFS with typically two choices per process implemented
- ICON forecast model much improved over last 12 months and now *overall* better than GME
- A few examples of recent changes to physical parameterizations shown here
- Target implementation in Dec. 2014 globally at 13km resolution with 90 levels to 75km, nesting and ensembles later

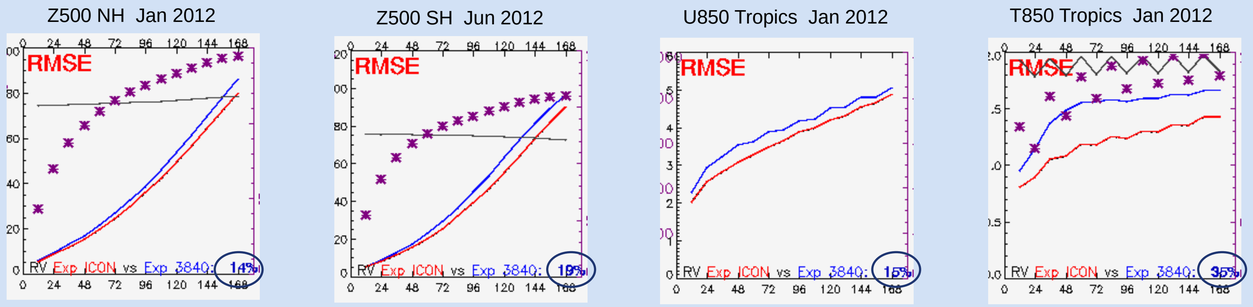
Process	Authors	Scheme	Origin
Radiation	Mlawer et al. (1997) Barker et al. (2002)	RRTM (later with McICA & McSI)	ECHAM6/IFS
	Ritter and Geleyn (1992)	δ two-stream	GME/COSMO
Non-orographic gravity wave drag	Scinocca (2003) Orr, Bechtold et al. (2010)	wave dissipation at critical level	IFS
Sub-grid scale orographic drag	Lott and Miller (1997)	blocking, GWD	IFS
Cloud cover	Doms and Schättler (2004)	sub-grid diagnostic	GME/COSMO
	Köhler et al. (new development)	diagnostic (later prognostic) PDF	ICON
Microphysics	Doms and Schättler (2004) Seiffert (2010)	prognostic: water vapor, cloud water,cloud ice, rain and snow	GME/COSMO
Convection	Bechthold et al. (2008)	mass-flux shallow and deep	IFS
	Plant, Craig (2008)	stochastic based on Kain-Fritsch	LMU, Munich
Turbulent transfer	Raschendorfer (2001)	prognostic TKE	COSMO
	Mironov, Mayuskava (new)	prognostic TKE and scalar variance	COSMO
	Neggers, Köhler, Beljaars (2010)	EDMF-DUALM	IFS
Land	Heise and Schrodin (2002), Helmert, Mironov (2008, lake)	tiled TERRA + FLAKE + multi-layer snow	GME/COSMO
	Raddatz, Knorr	JSBACH	ECHAM6

Improvements in RMS at 500/850hPa from 201210 to 201306

ICON state 201210

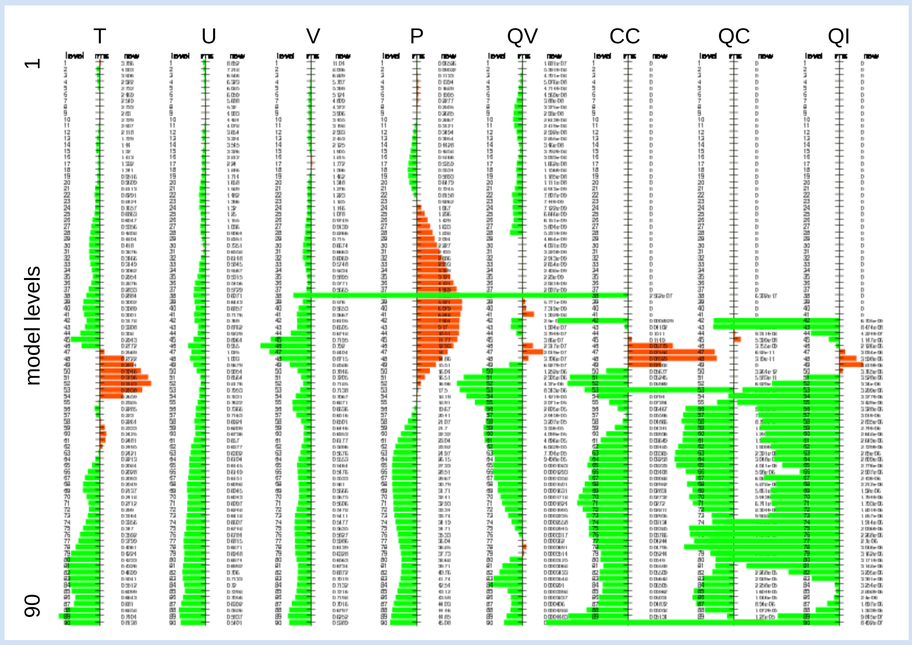


ICON state 201306



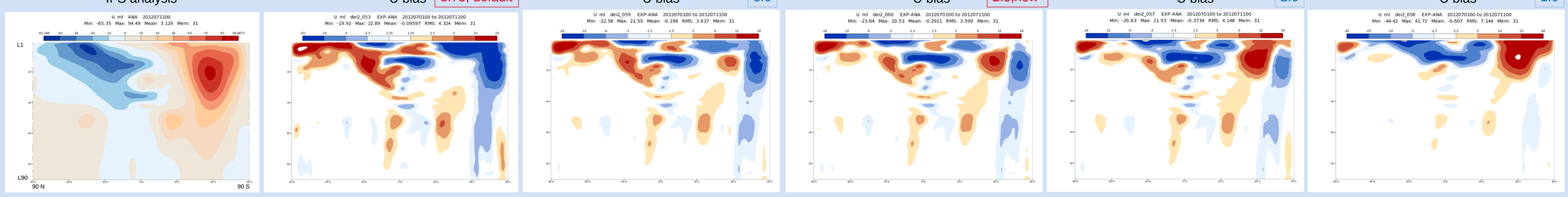
ICON and **GME** RMS vs. IFS analysis

Improvements in RMS by Level from 201302 to 201305



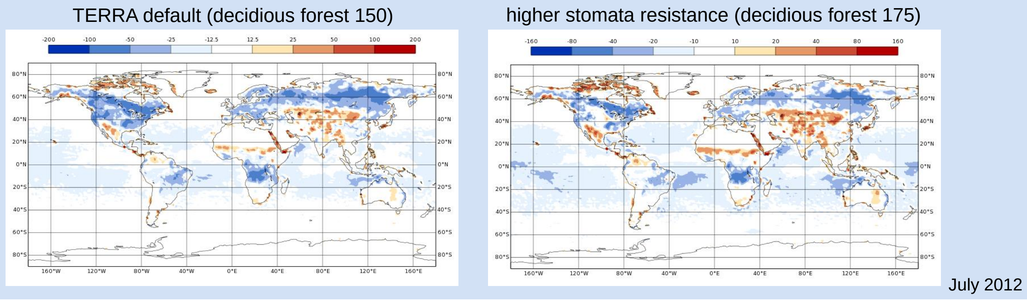
non-orographic gravity wave tuning

launch amplitude x10^{-3}Pa



latent heat flux bias land – sensitivity to stomata resistance

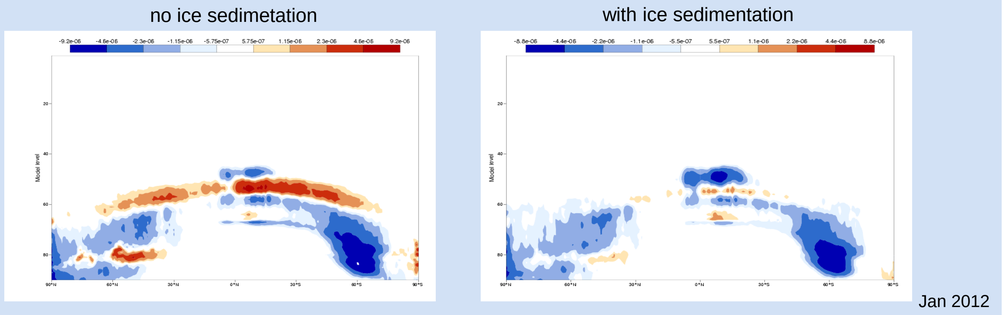
LHF bias



July 2012

add ice sedimentation

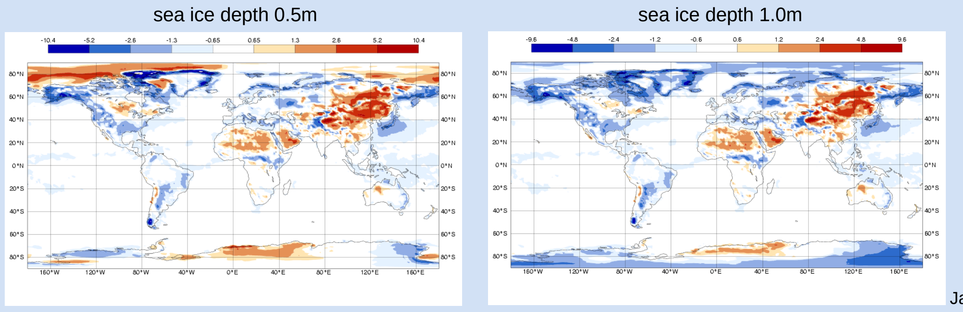
Q,ice bias



Jan 2012

sea ice depth initialization

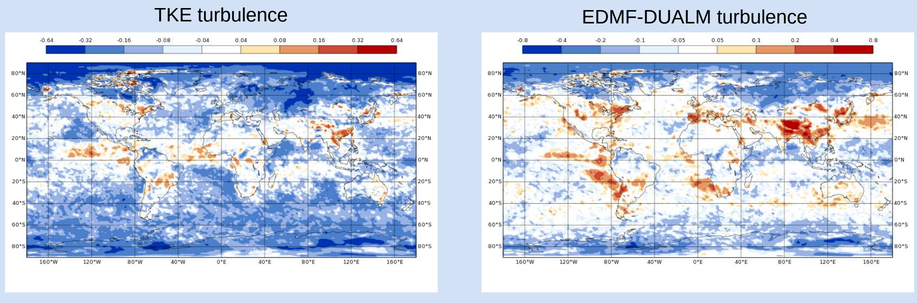
T L90 bias



Jan 2012

total cloud cover: BL schemes

TCC bias



Jan 2012

All biases here refer to comparisons to IFS analysis or 24h forecast for fluxes.