Deutscher Wetterdienst
Wetter und Klima aus einer Hand

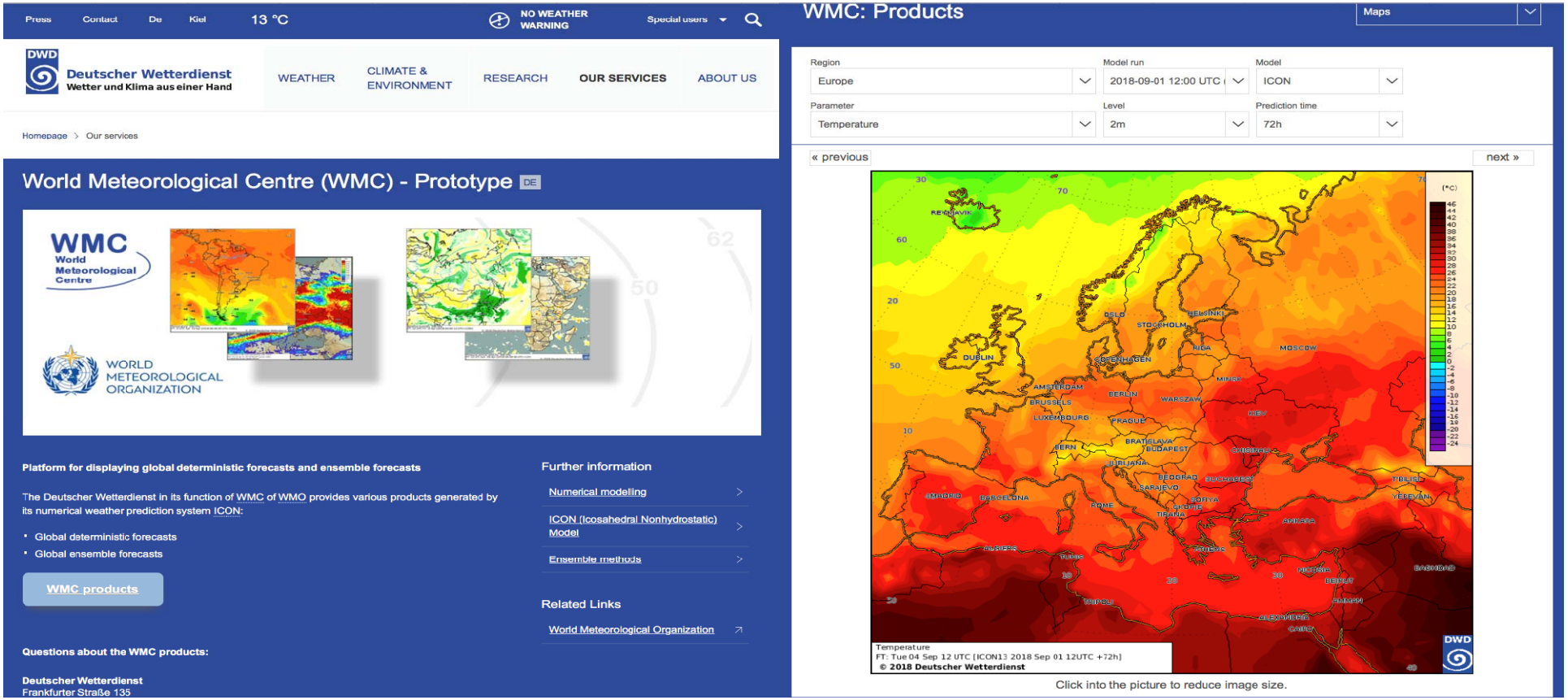
ICON News:
ICON-D2, World Met Centre

Martin Köhler
DWD

DWD is World Meteorological Center

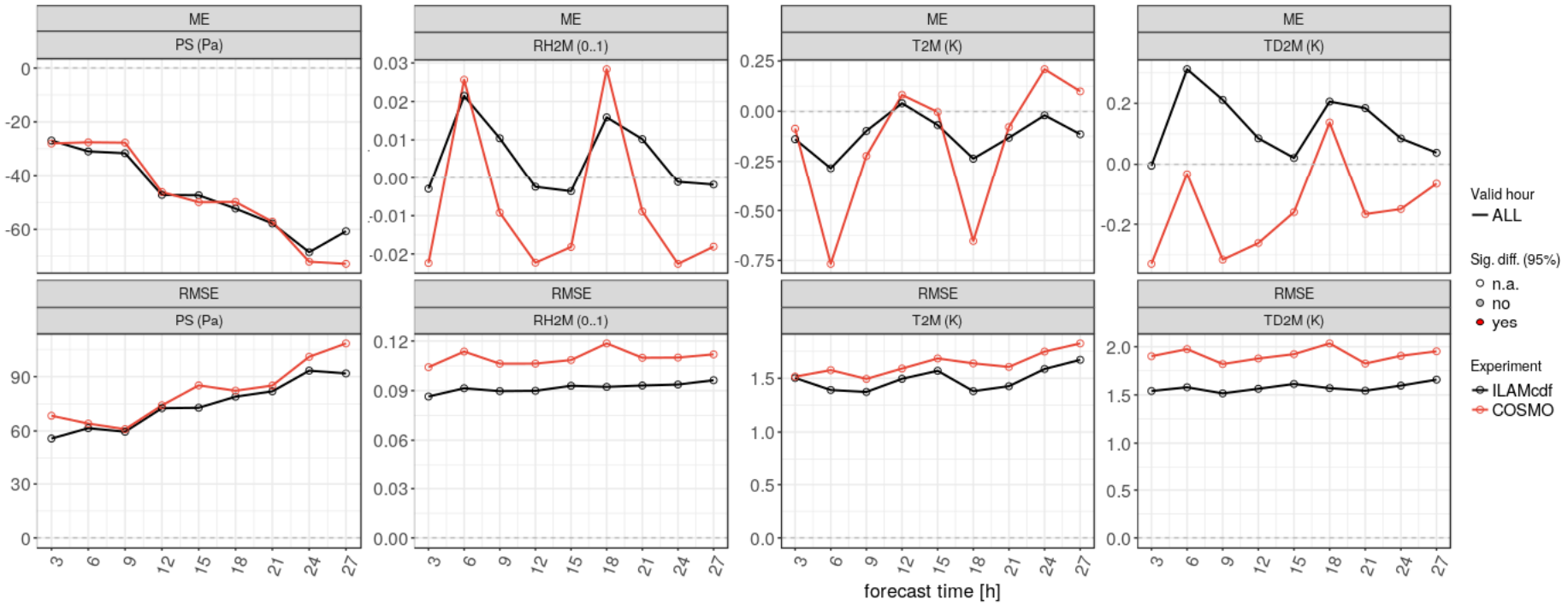
open data and plots: **globale ICON deterministic and EPS**, **all variables**

centers: **DWD**, ECMWF, Tokyo, Beijing, Exeter, Montreal, Washington, Moscow and Melbourne



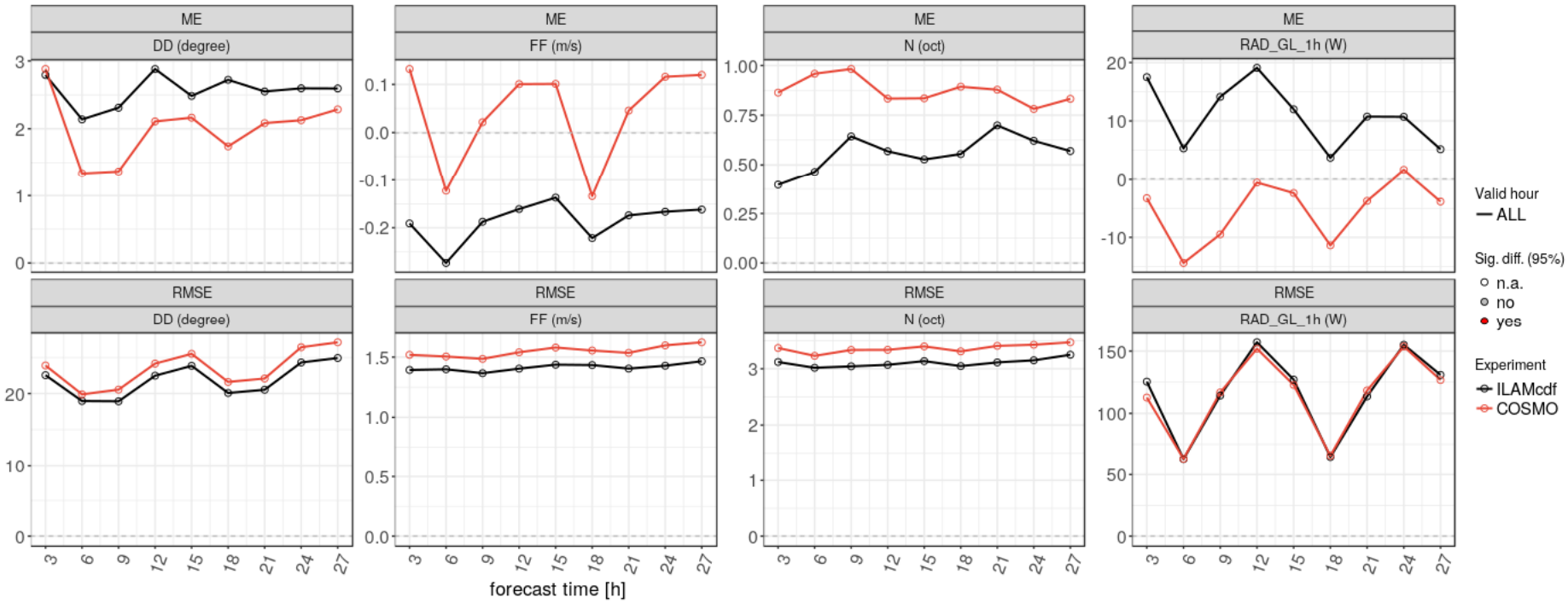
ICON-D2 based on ICON-EU June 2018

p,surface RH 2m T 2m TD 2m



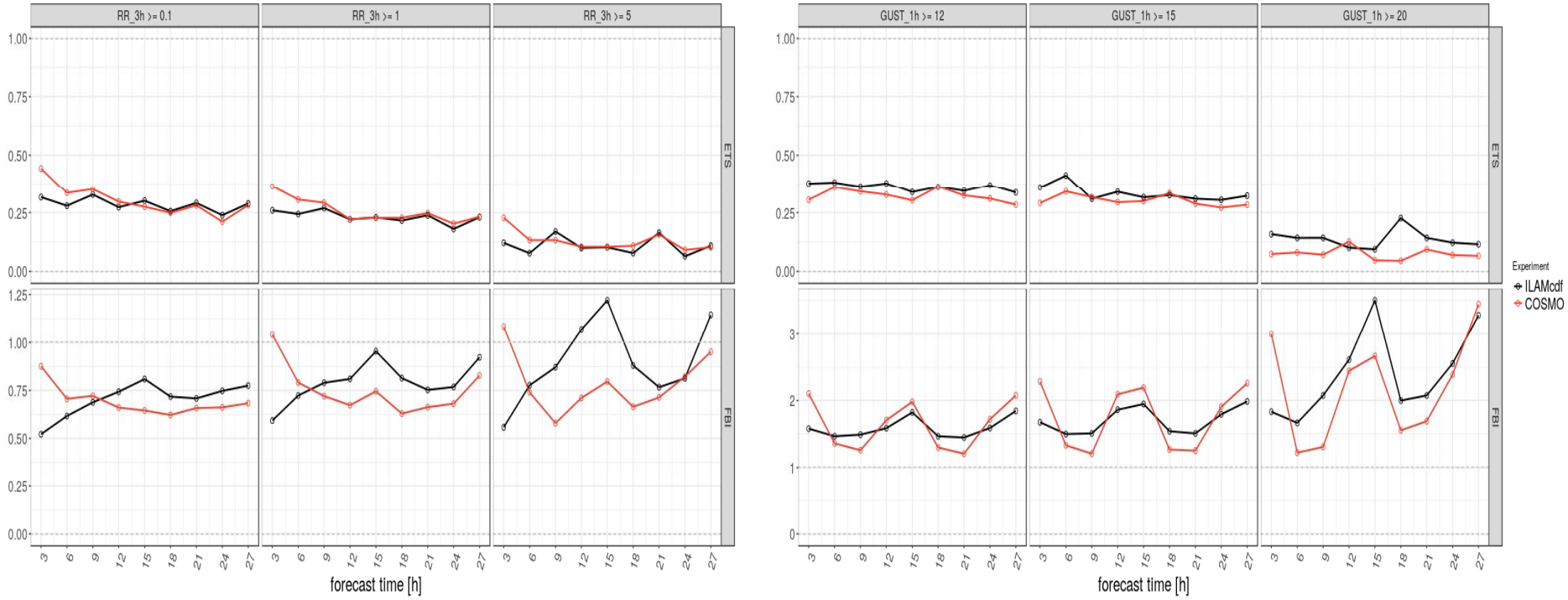
ICON-D2 based on ICON-EU June 2018

U 10m dir | U 10m speed | total cloud | solar surface down



ICON-D2 based on ICON-EU June 2018

precip >0.1 | precip > 1.0 | precip > 5.0 | gust 1h >12 | gust 1h >15 | gust 1h >20



ICON-D2 based on ICON-EU June 2018

COSMO better ILAMcdf better

RH 2m

T 2m

TD 2m

U 10m dir

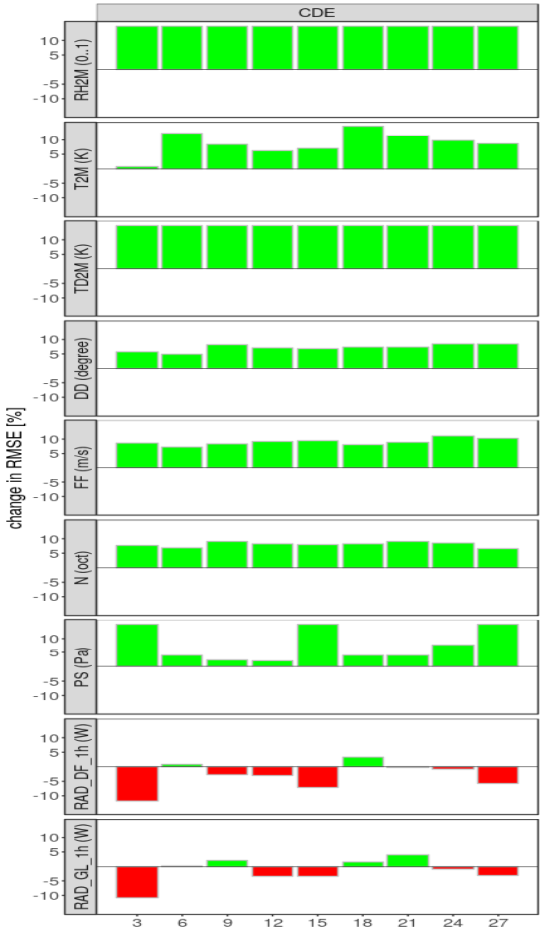
U 10m speed

total cloud

p,surface

solar diffuse

solar total



gust 1h >12

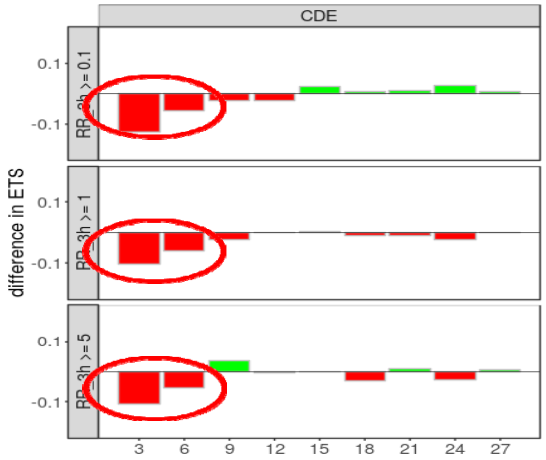
gust 1h >15

gust 1h >20

precip >0.1

precip > 1.0

precip > 5.0



No LHN in ICON-D2

ICON D2: results sofar

- most variables significantly better than COSMO-D2

- exceptions:
  - precip spin-up (6h): no latent heat nudging yet
  - solar surface flux too high: cloud/aerosol/radiation improvements
  -

- focus of further physics developments on ICON

- forward operators being adopted to ICON framework

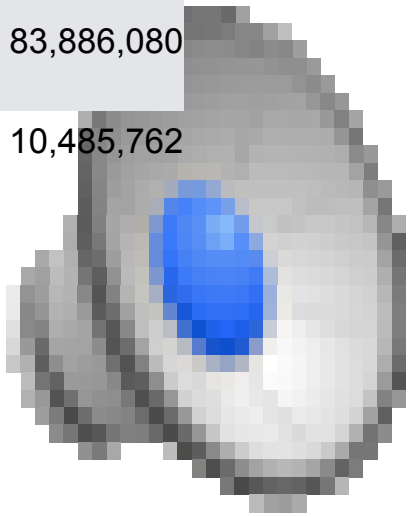
ICON D2: plan for implementation

- September 2018: start routine deterministic ICON-D2 forecasts
- Summer 2019: start routine ICON-D2 EPS system
  (requires resource reshuffling)
- Q4 2020: replacement of COSMO-D2 with ICON-D2

extra slides

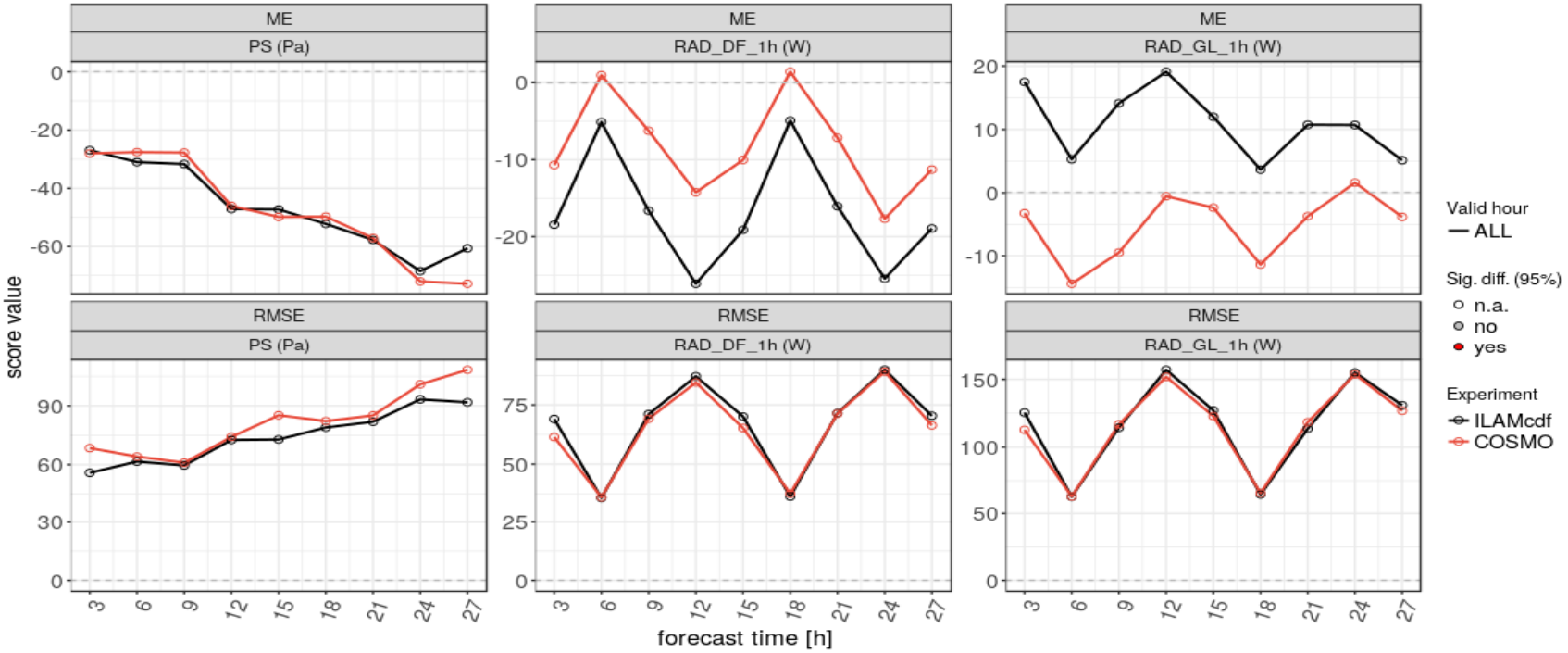
DYAMOND

Model	Horizontal Resolution	Vertical level	Model top	#columns
SAM	4km	74	37km	42,467,328
FV3	3.25km	75	3hPa	56,623,104
ICON (varying/fixed SST)	5km	90	75km	20,971,520
ICON (only two weeks so far)	2.5km	90	50km	83,886,080
NICAM	7km	78	50km	10,485,762



ICON-D2 based on ICON-EU June 2018

p,surface | solar diffuse | solar total



The *deterministic* NWP-System in 2018

Global model ICON

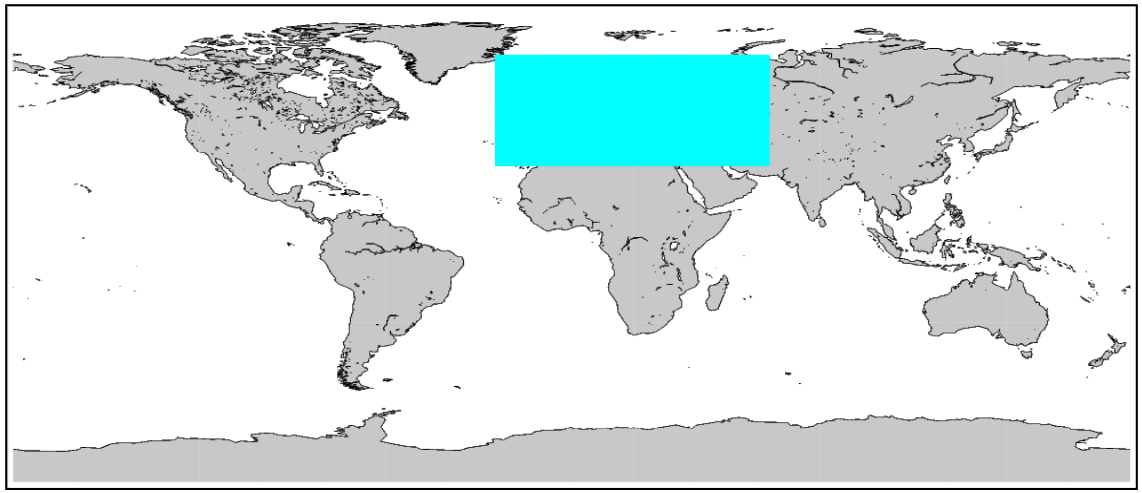
Grid spacing: 13 km
Number of layers: 90
Forecast range:
180 h from 00 and 12 UTC
120 h from 06 and 18 UTC
30 h from 03, 09, 15 and 21UTC

Grid cell area: 173 km^2

ICON-EU Nest area Europe

Grid spacing: 6.5 km
Number of layers: 60
Forecast range:
120 h from 00, 06, 12 and 18 UTC
30 h from 03, 09, 15 and 21UTC

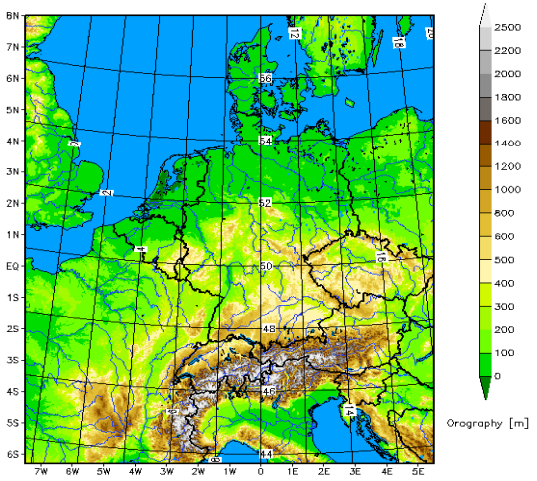
Grid cell area: 43 km^2



COSMO-D2

Grid spacing: 2.2 km
Number of layers: 65
Forecast range:
27/45 h from 00, 03, 06, 09, 12, 15, 18, 21 UTC
651x716 grid points

Grid cell area: 5 km^2



The *probabilistic* NWP-System in 2018

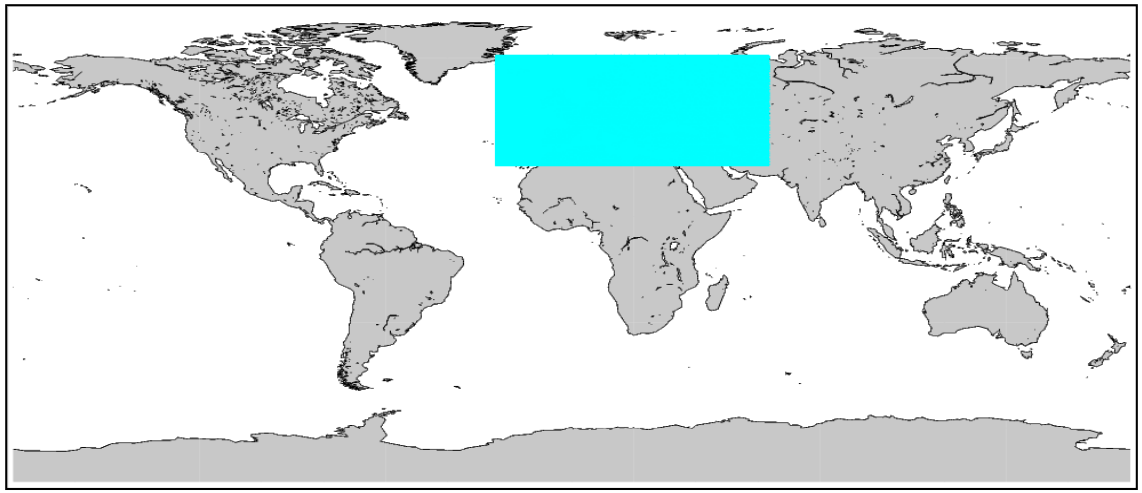
ICON-EPS; M40

Grid spacing: 40 km
Number of layers: 90
Forecast range:
180 h from 00 and 12 UTC
120 h from 06 and 18 UTC
30 h from 03, 09, 15 and 21UTC
Grid cell area: 1638 km^2

ICON-EU-EPS Europe-Nest

Grid spacing: 20 km
Number of layers: 60
Forecast range:
120 h from 00, 06, 12 and 18 UTC
30 h from 03, 09, 15 and 21UTC

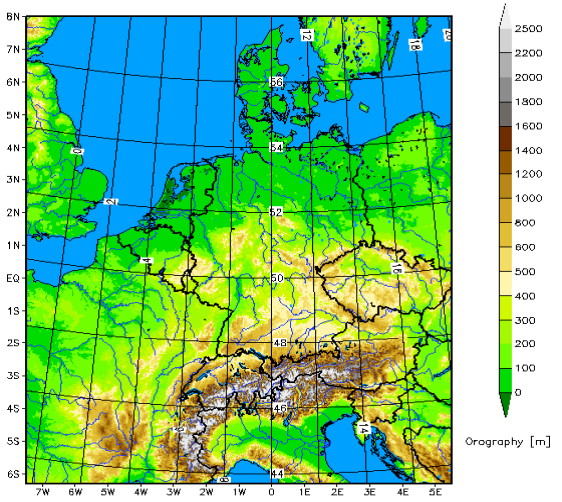
Grid cell area: 407 km^2



COSMO-D2-EPS; M20

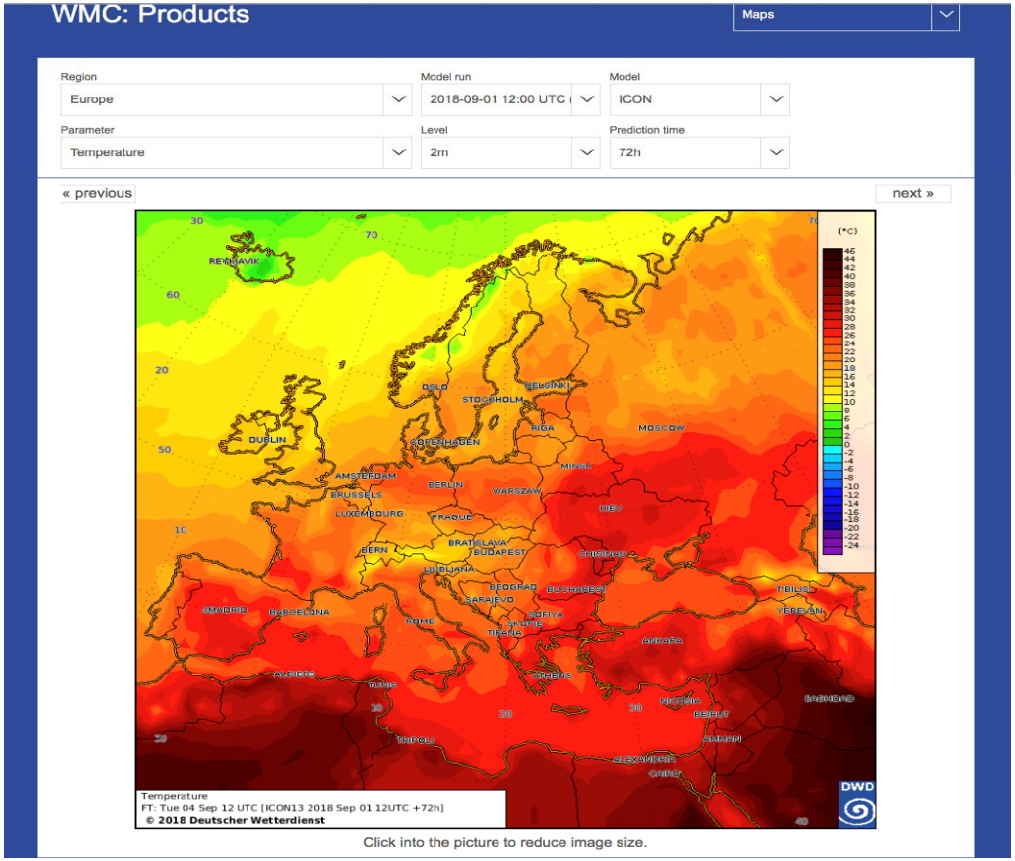
Grid spacing: 2.2 km
Number of layers: 65
Forecast range:
27/45 h from 00, 03, 06, 09, 12, 15, 18, 21 UTC
651x716 grid points

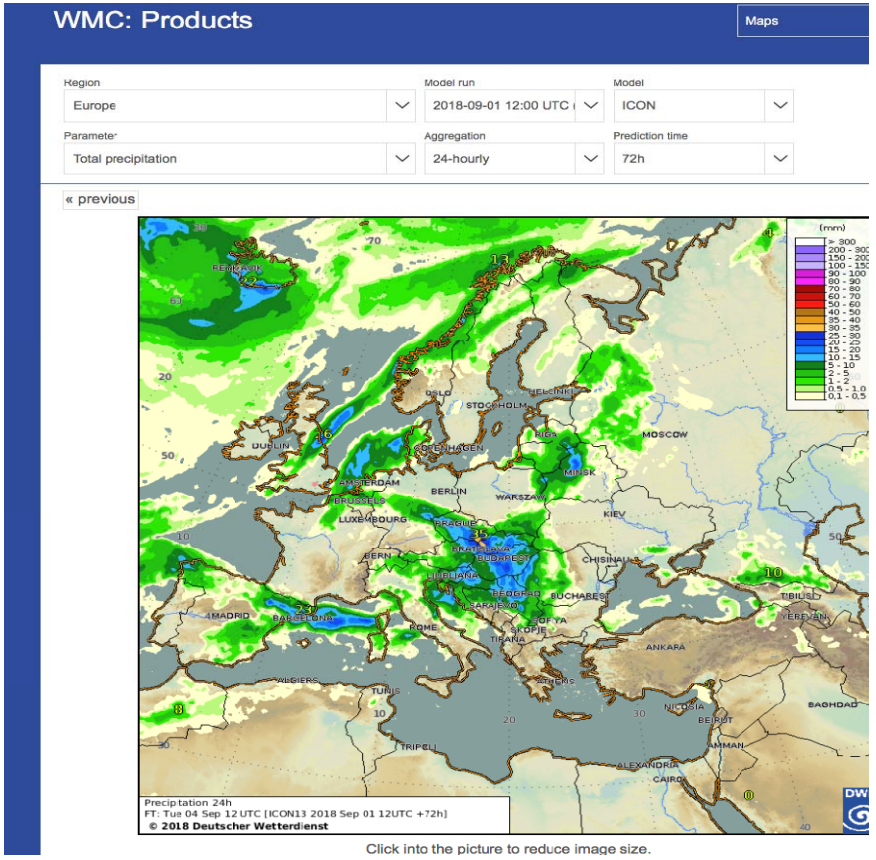
Grid cell area: 5 km^2



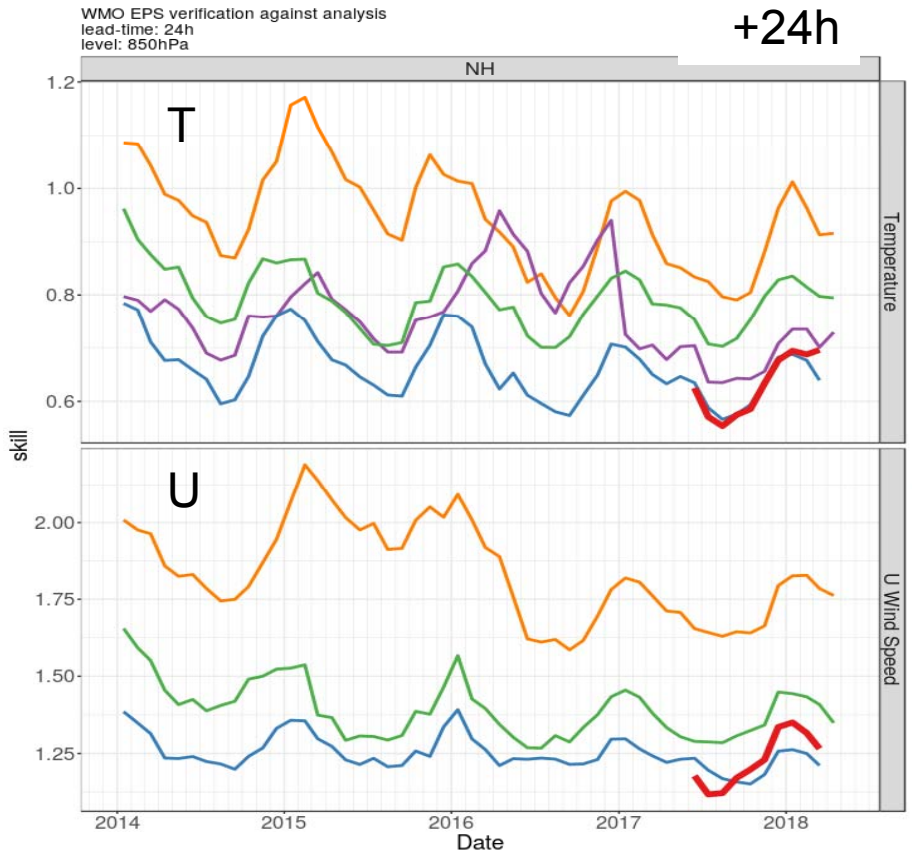
World Meteorological Center

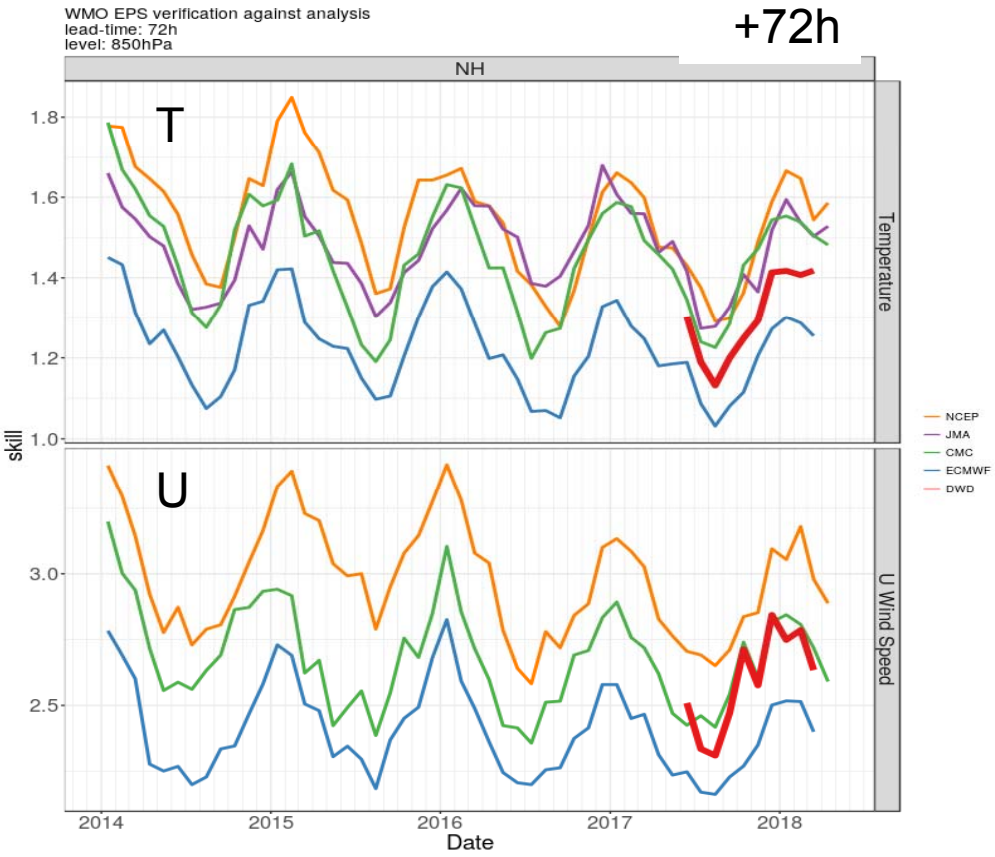
added: ECMWF, Tokyo, Beijing, Exeter and Montreal
original: Washington, Moscow and Melbourne



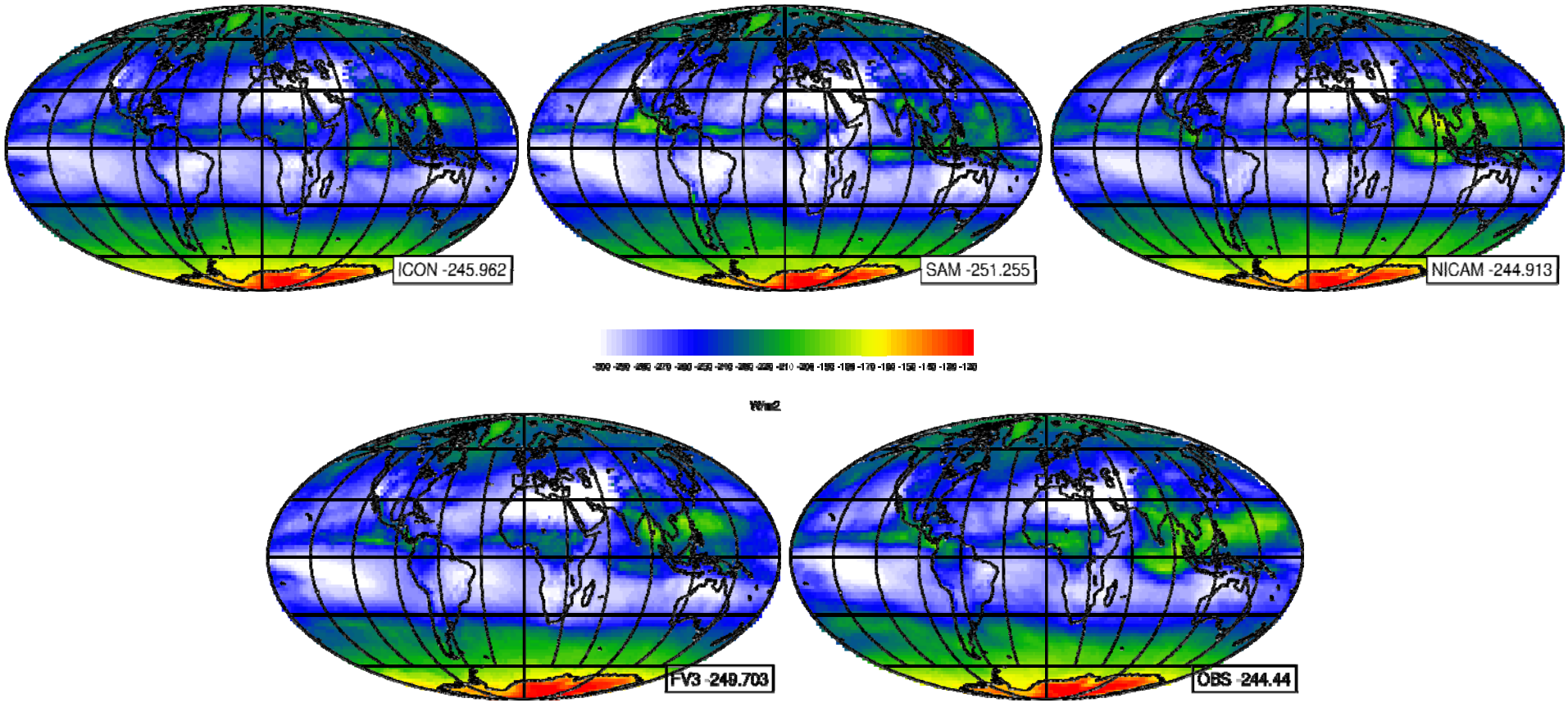


Skill = RMSE


WMO EPS verification against analysis
lead-time: 24h
level: 850hPa
+24h
NH
T
U
Temperature
U Wind Speed
skill
1.2
1.0
0.8
0.6
2.00
1.75
1.50
1.25
2014
2015
2016
2017
2018
Date

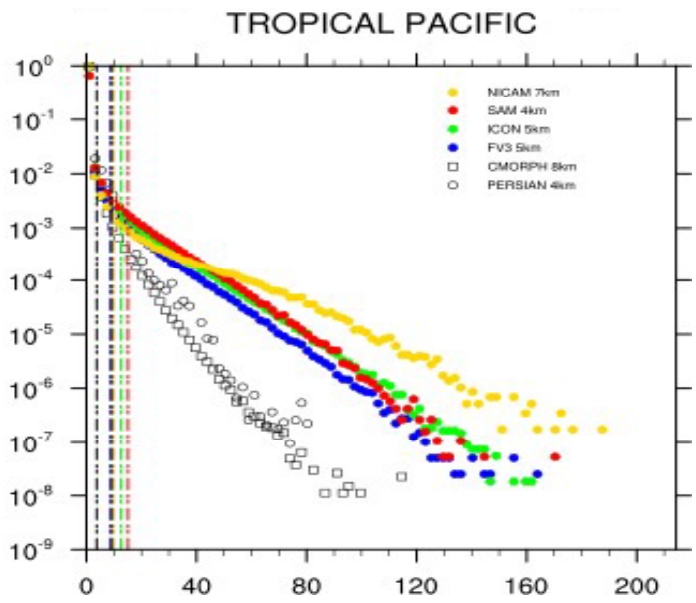

WMO EPS verification against analysis
lead-time: 72h
level: 850hPa
+72h
NH
T
U
Temperature
U Wind Speed
skill
1.8
1.6
1.4
1.2
1.0
3.0
2.5
2014
2015
2016
2017
2018
Date
NCEP
JMA
CMC
ECMWF
DWD

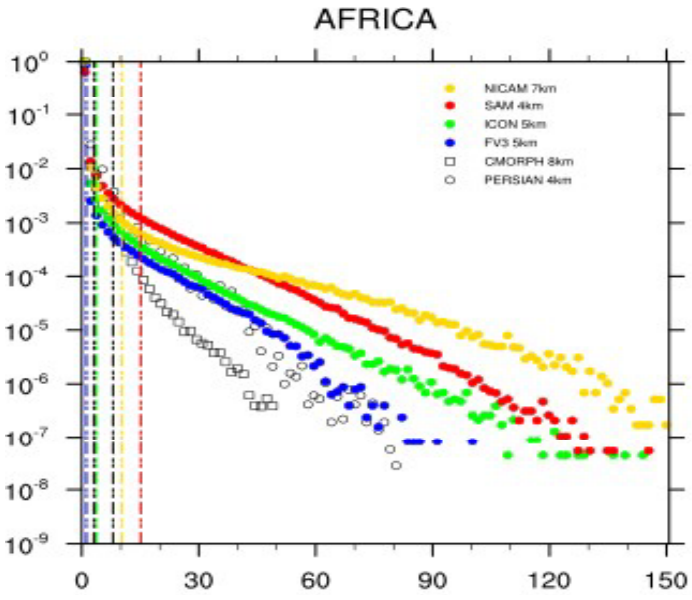
40 (SAM last 35) day average top of atmosphere outgoing long wave radiation



Bjorn Stevens (MPI) and Daniel Klocke (DWD)

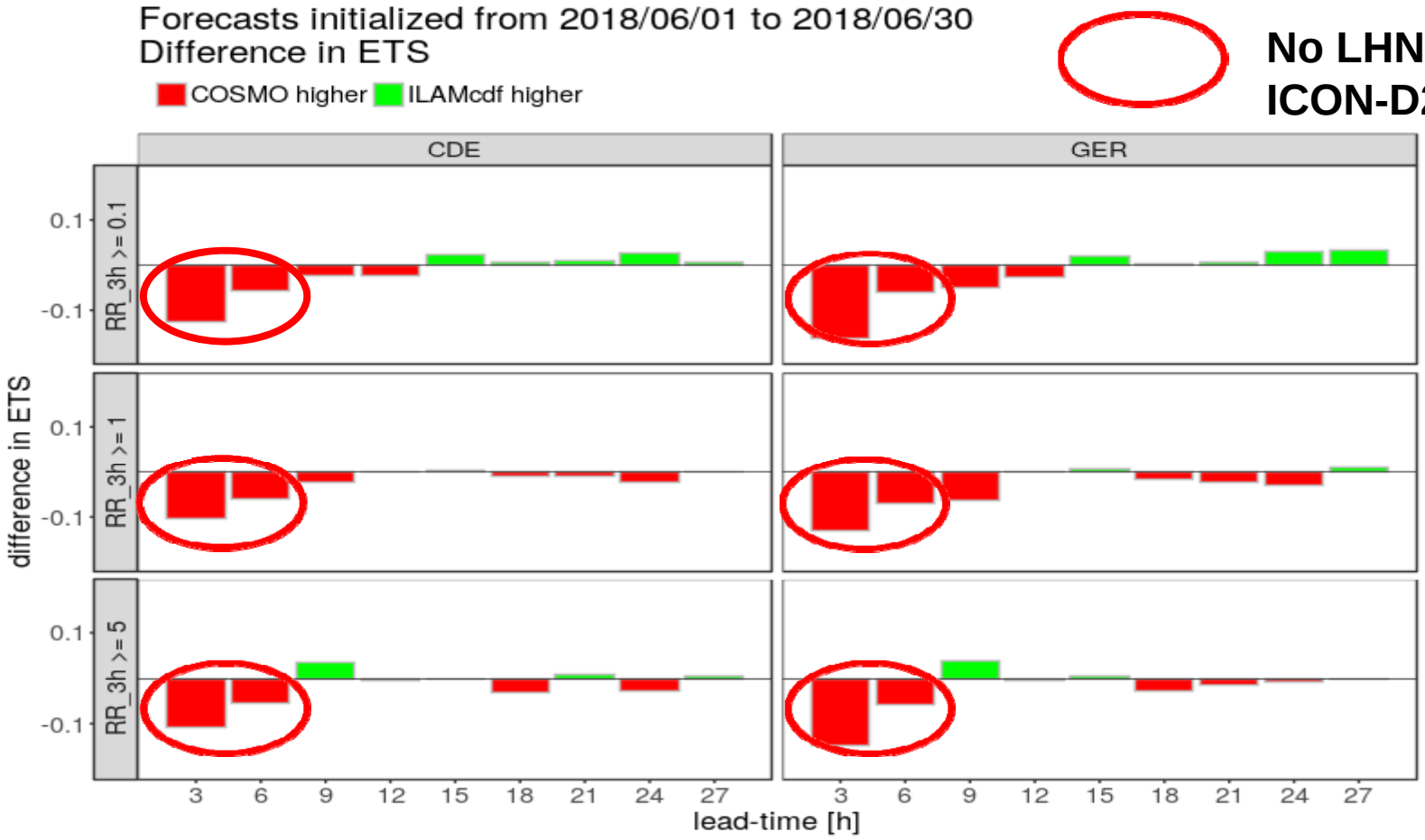
DYAMON: Hourly precipitation PDFs (11–16 Aug 2016)



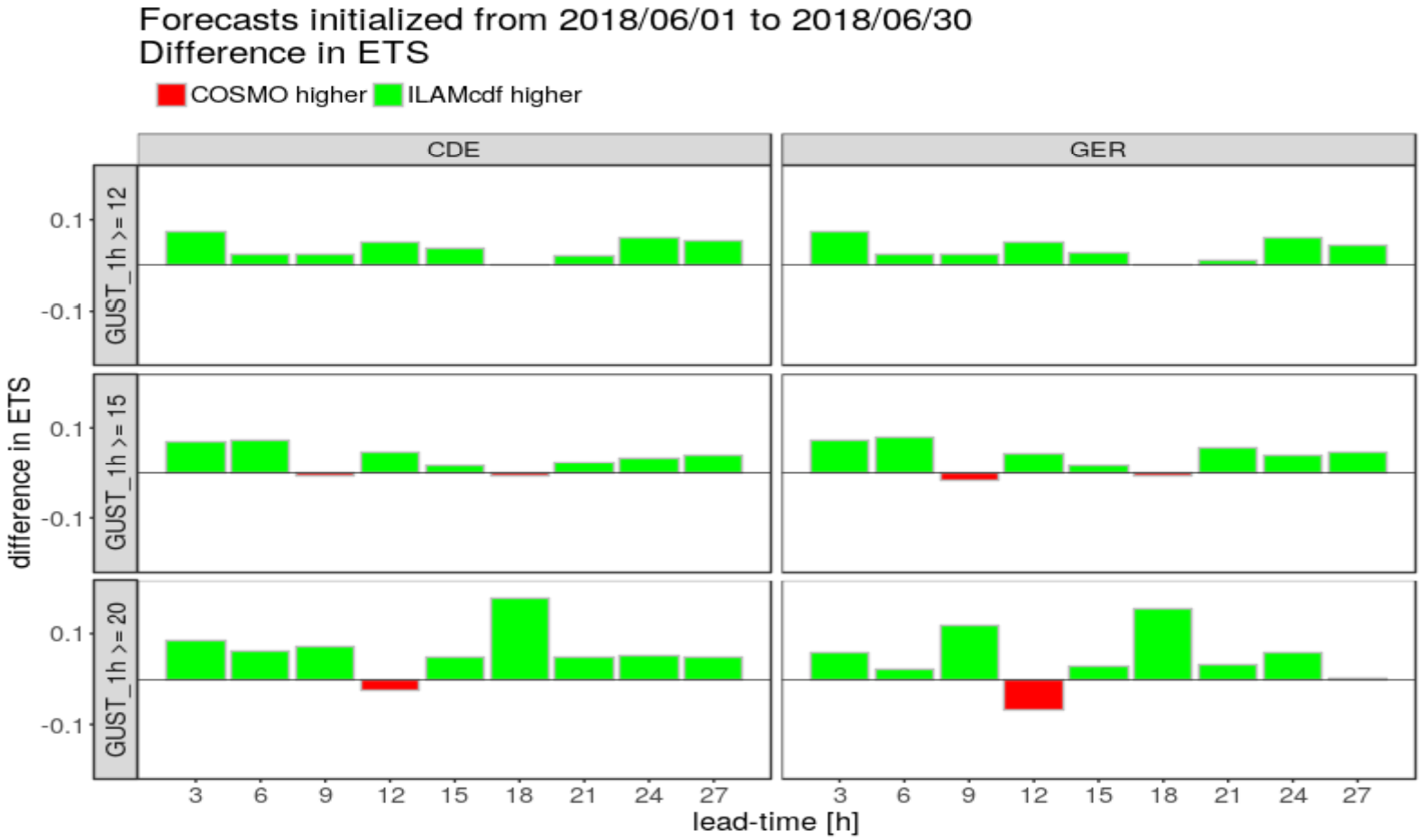


Christopher Mosley, Chao Li (MPI), Kameswarrao Modali and Shabeh Hasson (UniHH)

ICON-D2 based on ICON-EU June 18, Part VI



ICON-D2 based on ICON-EU June 18, Part VIII



Aktueller Status der Arbeiten

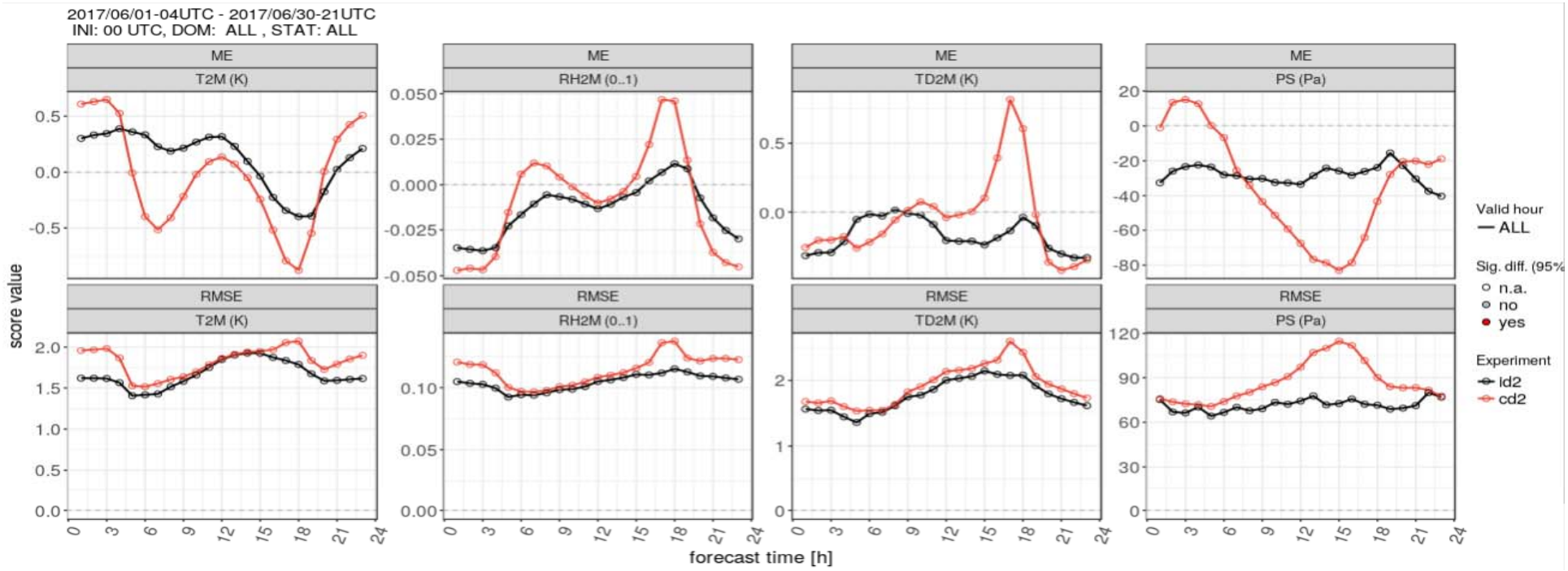
- **Kopplung mit Datenassimilation (KENDA + latent-heat nudging): technisch lauffähig, Tests zur Optimierung der Qualität laufen**
- **Vorbereitende Tests zum Tuning der Physik-Parameterisierungen auf Basis von Hindcast-Experimenten weitgehend abgeschlossen, weitere Optimierung im KENDA-Zyklus wird folgen**
- **Zu Monitoring-Zwecken werden demnächst regelmäßige Vorhersagen (deterministisch 00 + 12 UTC) mit interpolierten ICON-EU-Analysen gestartet**

Verifikationsergebnisse

- **1.: Hindcast-Experiment für Juni 2017: jeweils ein durchgehender Vorhersagelauf von 01.06.17, 00 UTC bis 01.07.17, 00 UTC, angetrieben mit Randdaten aus dem ICON-EU-Assimilationszyklus**
- **Verifikationsergebnisse zeigen Monatsmittelwerte als Funktion der Uhrzeit (in UTC)**

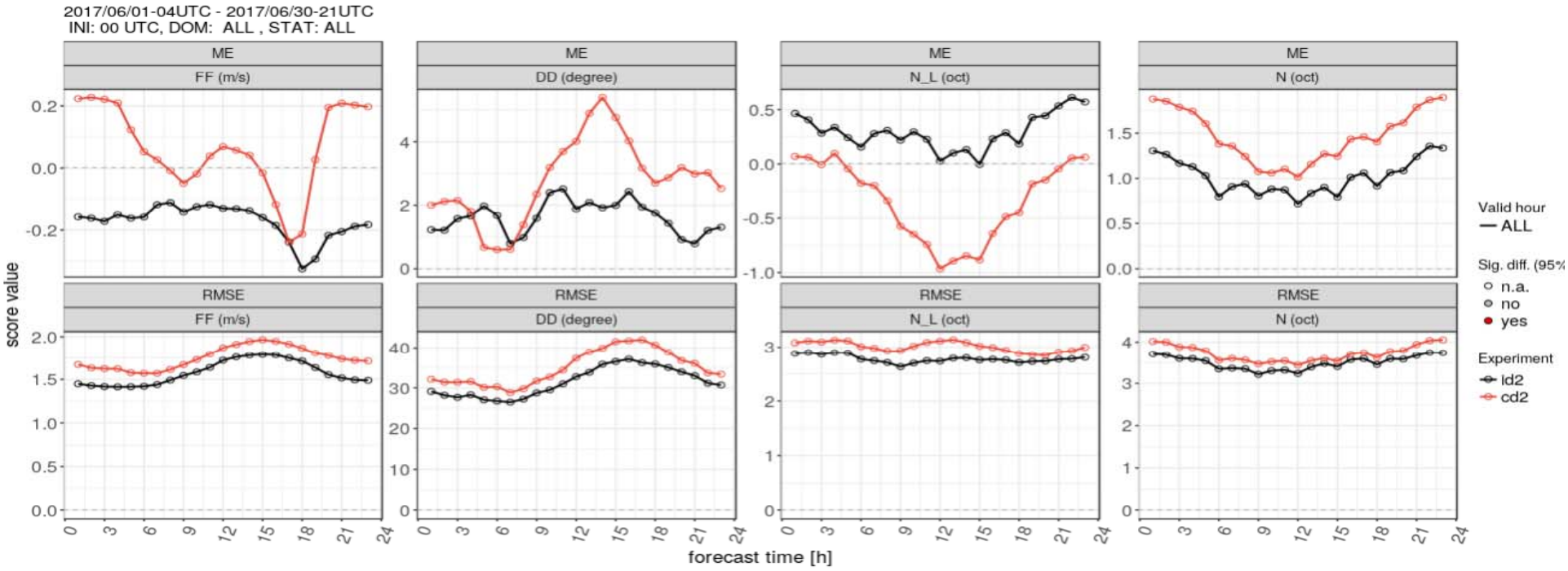
- **2.: Vorhersage-Experiment für Juni 2018, gestartet von interpolierten ICON-EU-Analysen, verglichen mit operationellen COSMO-D2-Vorhersagen**
- **Verifikationsergebnisse zeigen Monatsmittelwerte als Funktion der Vorhersagezeit, getrennt für 00-UTC und 12-UTC-Vorhersagen**

Temperature, humidity and pressure, hindcast June 2017, ICON vs. COSMO



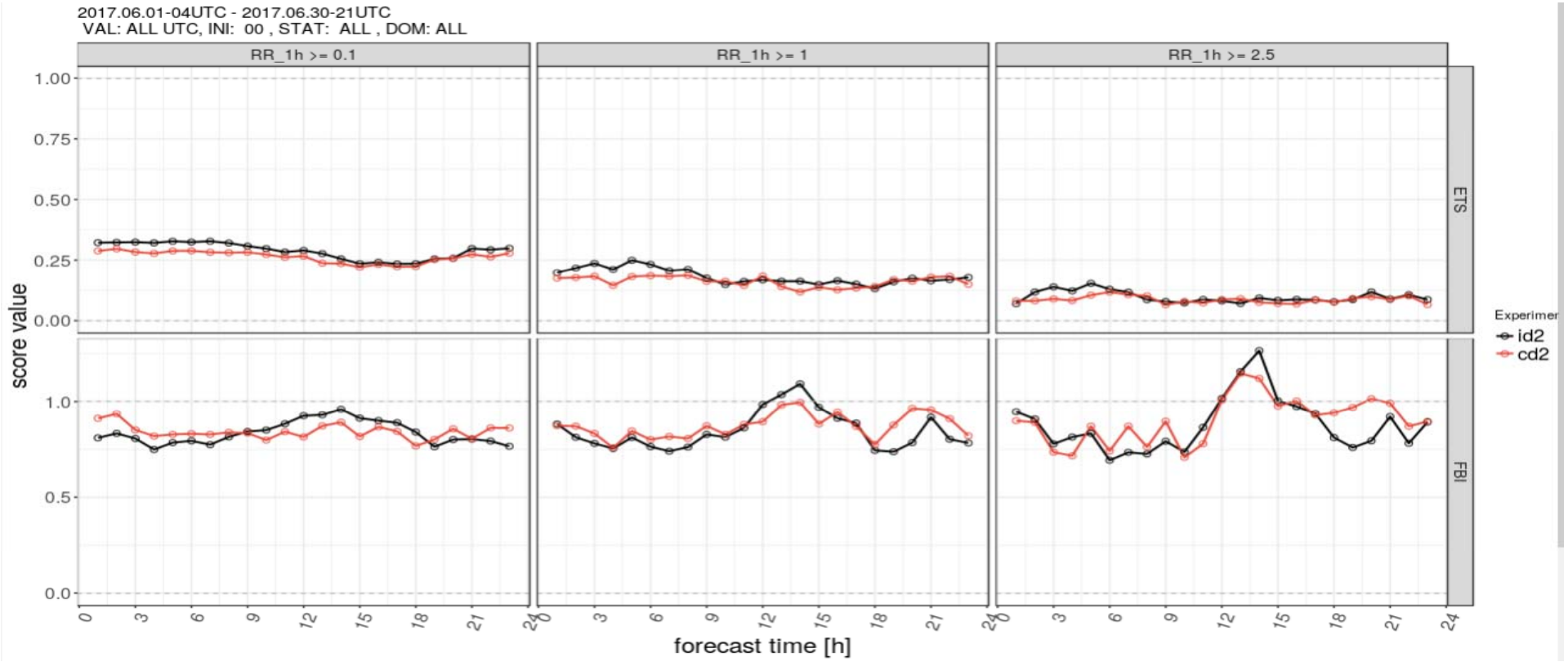
2m temperature | 2m humidity | 2m dewpoint | surface pressure

Wind and cloud cover, hindcast June 2017, ICON vs. COSMO



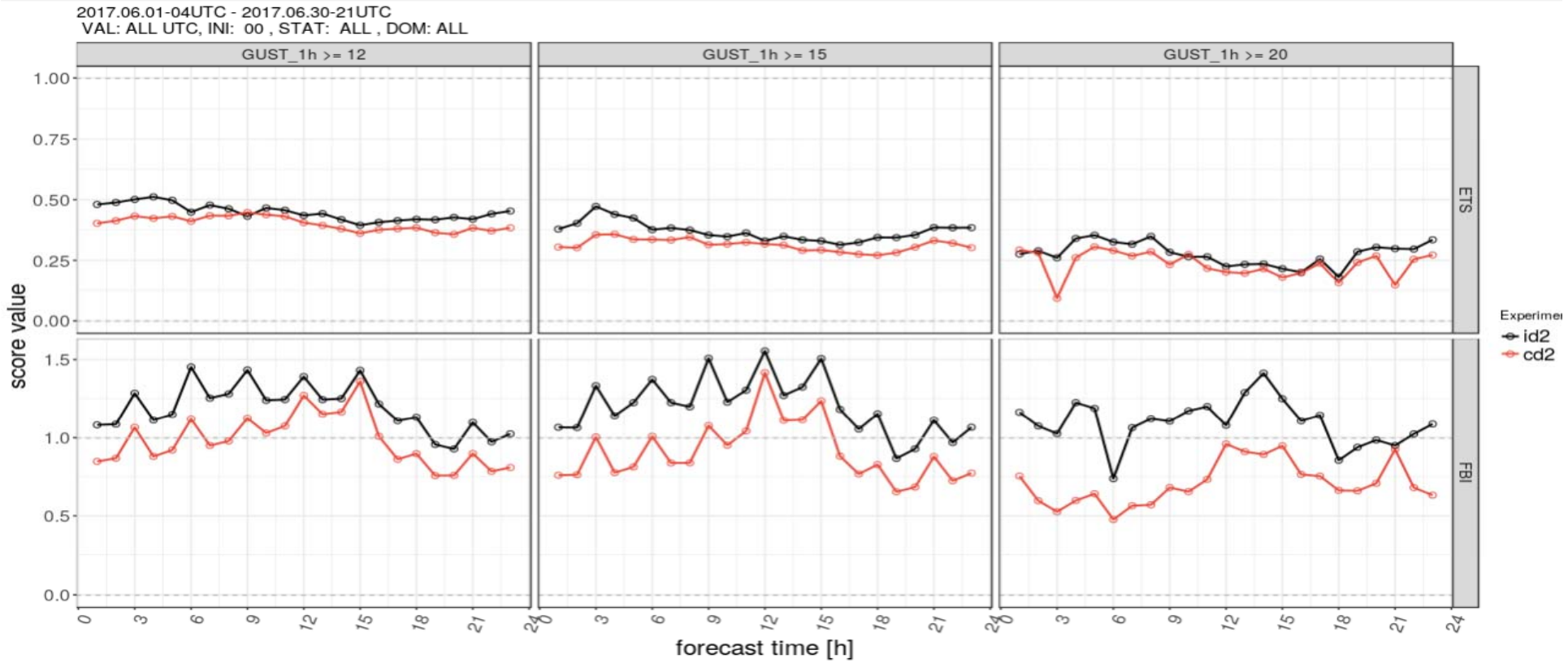
10m wind speed | 10m wind dir. | low cloud cover | total cloud cover

Precipitation, hindcast June 2017, ICON vs. COSMO



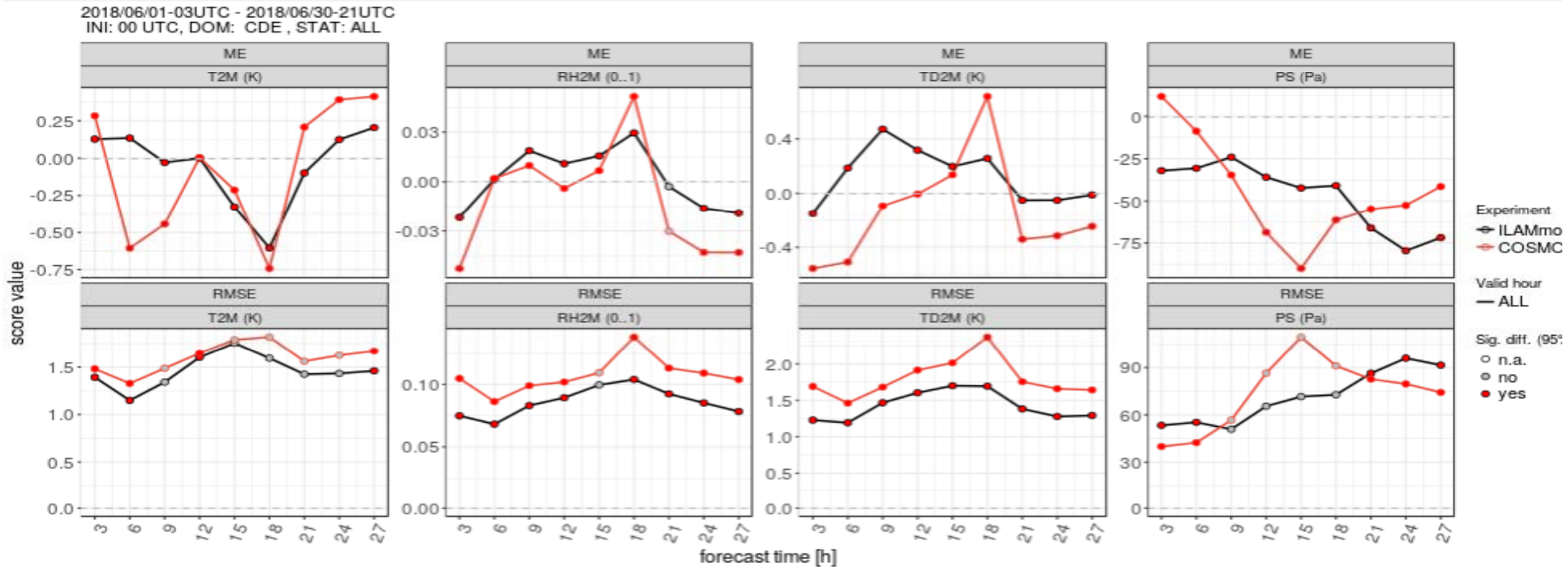
RR > 0.1 mm/h RR > 1 mm/h RR > 2.5 mm/h

Wind gusts, hindcast June 2017, ICON vs. COSMO



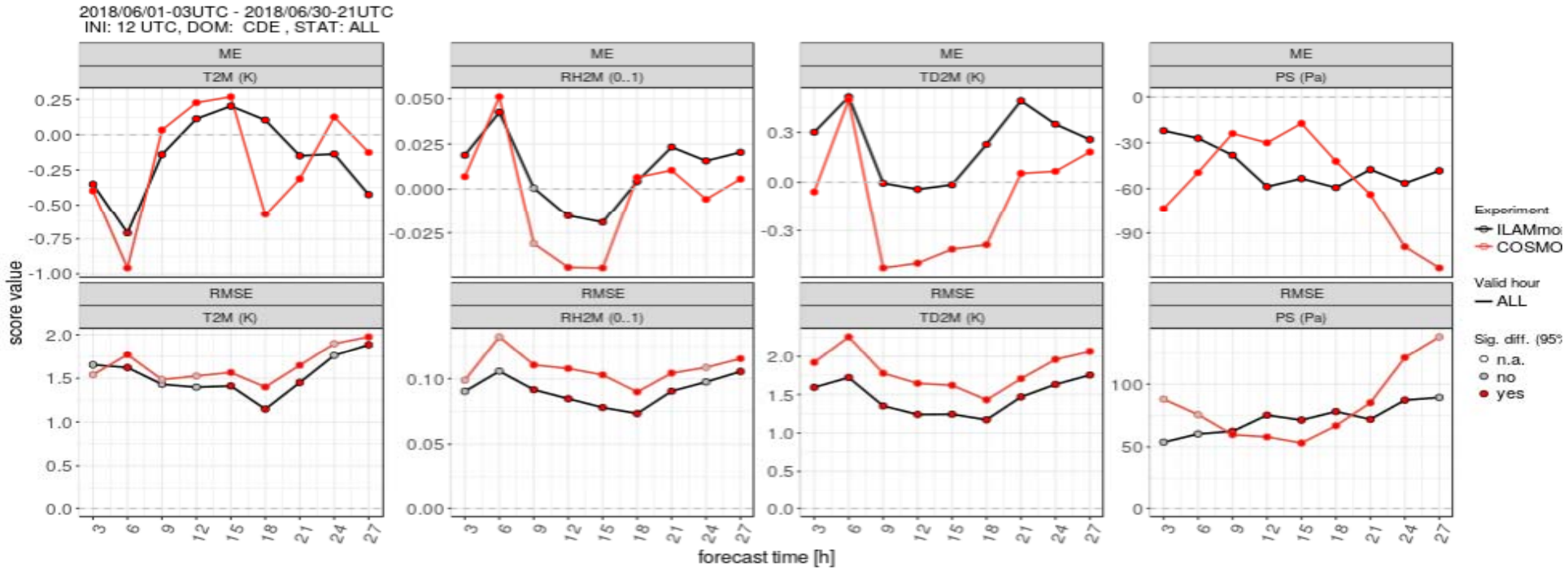
gusts > 12 m/s gusts > 15 m/s gusts > 20 m/s

Temperature, humidity and pressure, June 2018, 00-UTC forecasts, ICON vs. COSMO



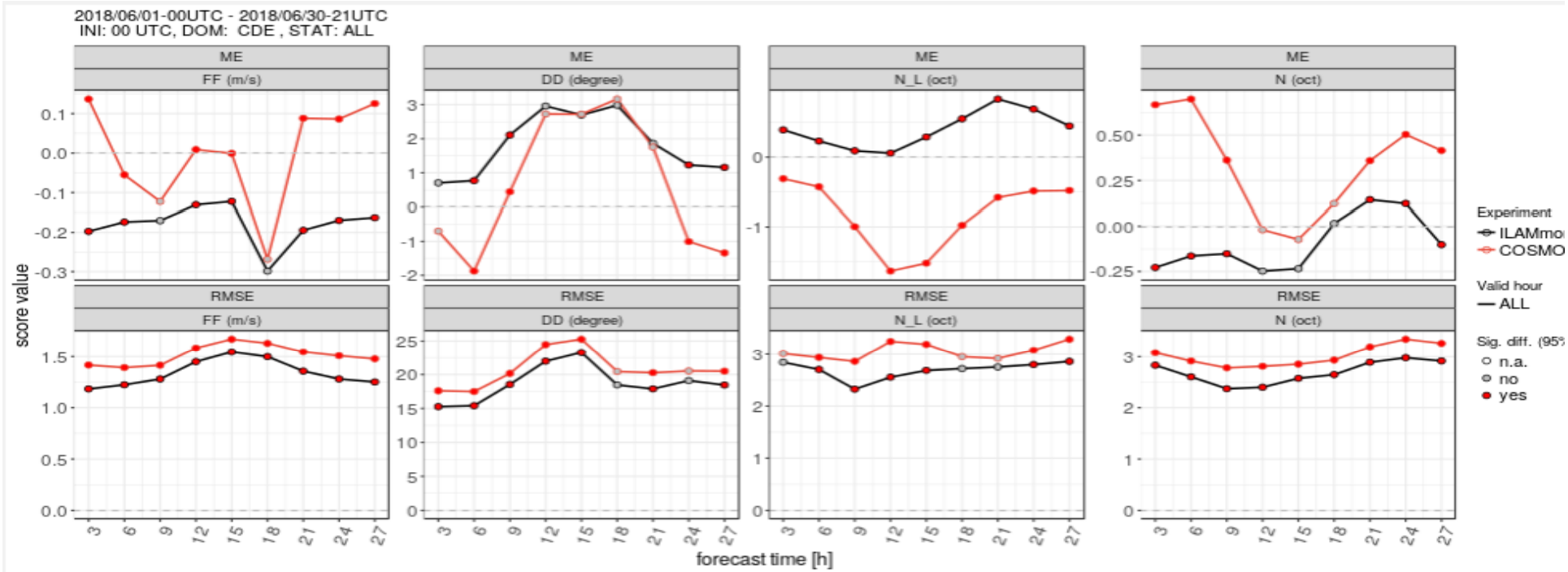
2m temperature 2m humidity 2m dewpoint surface pressure

Temperature, humidity and pressure, June 2018, 12-UTC forecasts, ICON vs. COSMO



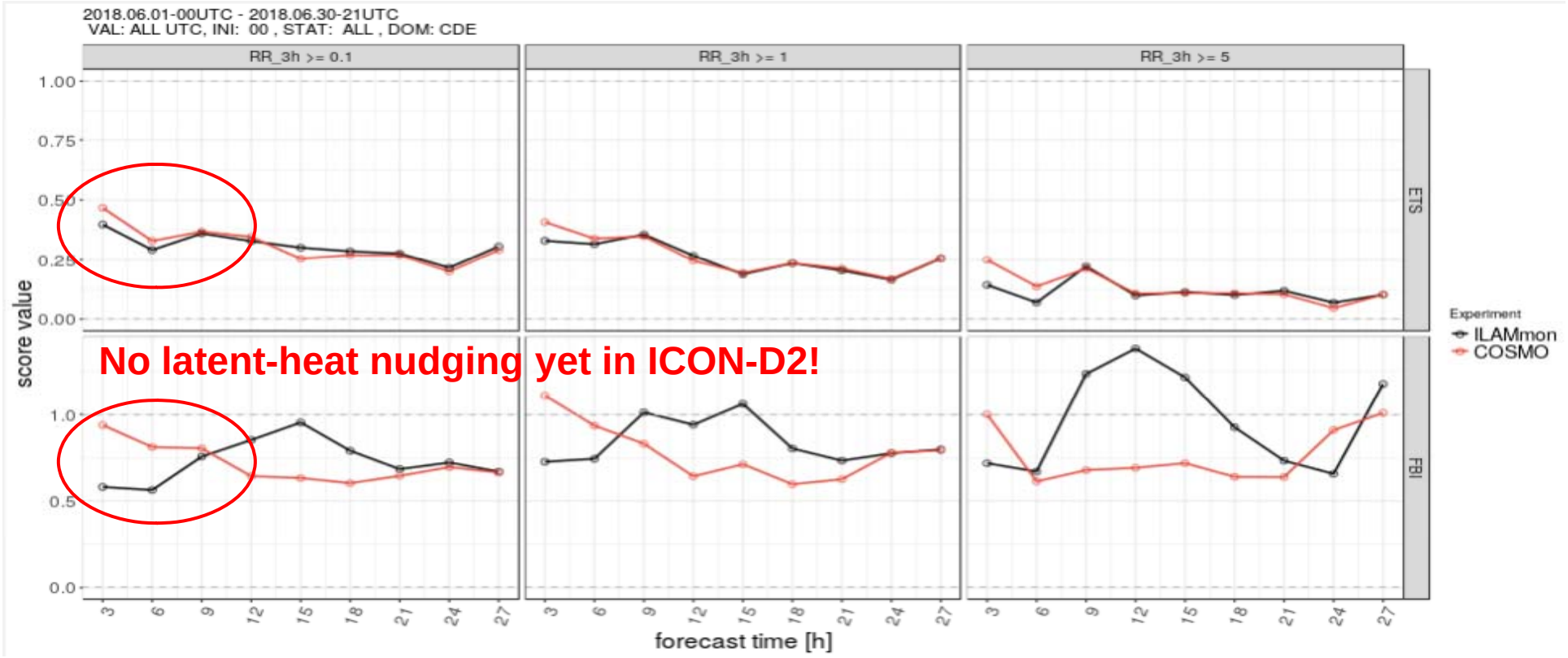
2m temperature | 2m humidity | 2m dewpoint | surface pressure

Wind and cloud cover, June 2018, 00-UTC forecasts, ICON vs. COSMO



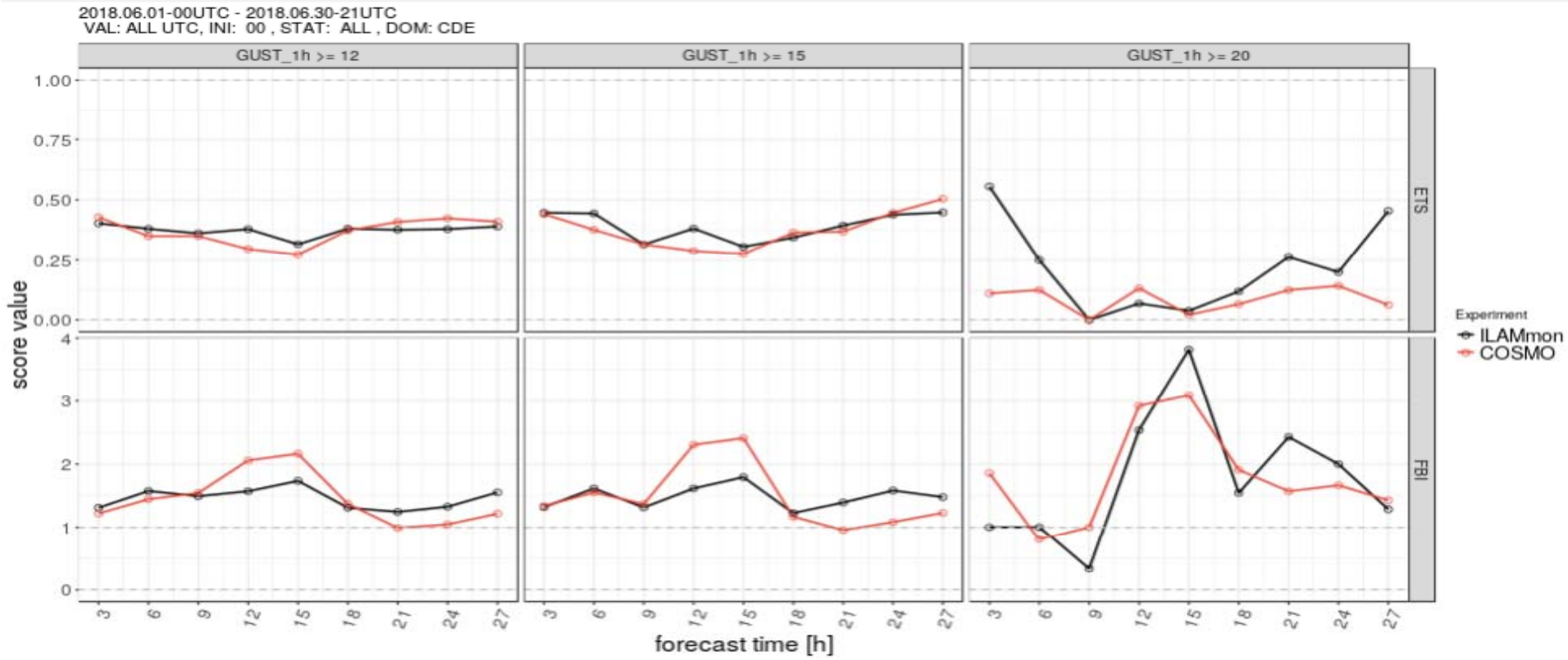
10m wind speed | 10m wind dir. | low cloud cover | total cloud cover

Precipitation,
June 2018, 00-UTC forecasts, ICON vs. COSMO



RR > 0.1 mm/3h RR > 1 mm/3h RR > 5 mm/3h

Wind gusts,
June 2018, 00-UTC forecasts, ICON vs. COSMO



gusts > 12 m/s gusts > 15 m/s gusts > 20 m/s

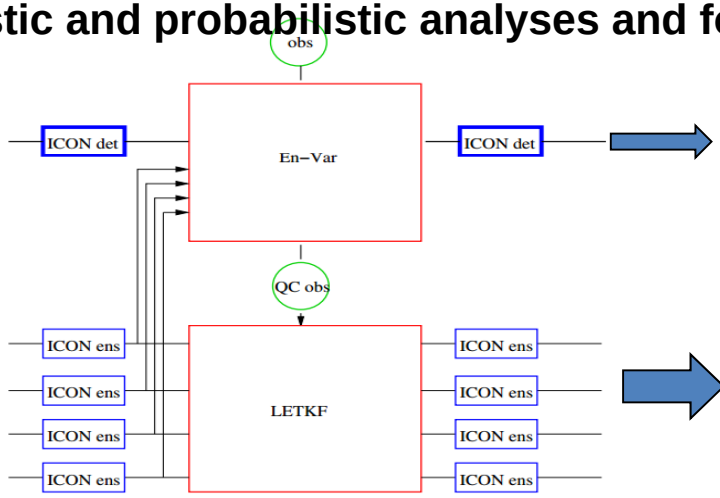
old

NWP DWD 2018

The operational NWP system of DWD in 2018

Deterministic and probabilistic analyses and forecasts on *global* and *regional* scales

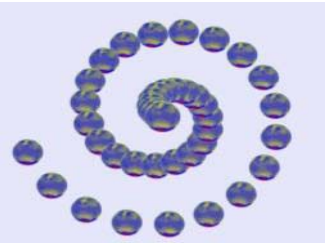
EnVAR Hybrid DA-System



ICON deterministic
13 / 6.5 km (Europe)

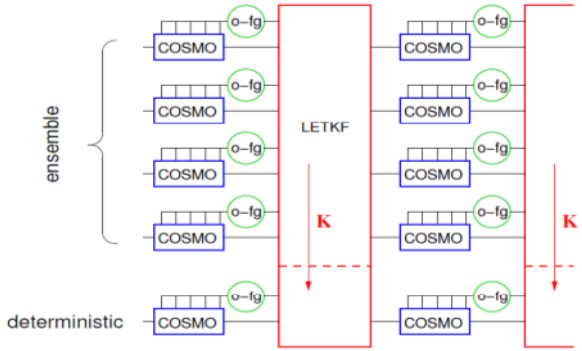
Global
Ensemble Data Assimilation
ICON-EDA
40 members
40/20 km

Global Ensemble Prediction System
ICON-EPS
40 members
40 / 20 km (Europe)

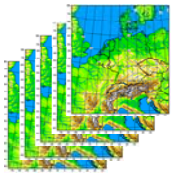


G L O B A L

Regional
Ensemble Data Assimilation
KENDA
40 members
2.2 km



Regional Ensemble Prediction System
COSMO-D2-EPS
20 members
2.2 km



Physics perturbations

COSMO-D2 deterministic
2.2 km

R E G I O N A L

M. Denhard, A. Rhodin, J. T. Ambadan, H. Anlauf, A. Fernandez del Rio, A. Cress, G. Zängl, H. Frank, T. Hanisch, C. Primo, F. Fundel, M. Buchhold, R. Potthast

ICON-EPS

operational suite (since 18th January 2018)

- 40 Member
- Global, 40 km / ICON-EU Nest, 20 km
- **00/12 UTC → +180h / 06/18UTC → +120h**
- **03/09/15/21 UTC → +30h** Boundary Conditions for COSMO-DE-EPS
- Perturbing physics tuning parameters (fixed during the forecast)
- Initial condition perturbations by global EDA (LETKF)

Operational ICON-EPS products with fieldextra

Global: 0,5° opendata.dwd.de : weather/wmc/icon-eps

www.dwd.de/DE/leistungen/wmc/wmc.html

EU: 0,25° charts available in NinJo at DWD

new: Probability of Turbulence (EDPP)

1. Mean and extreme values

- Unweighted mean of all members
- Spread of all members
- Minimum of all ensemble members
- Maximum of all ensemble members

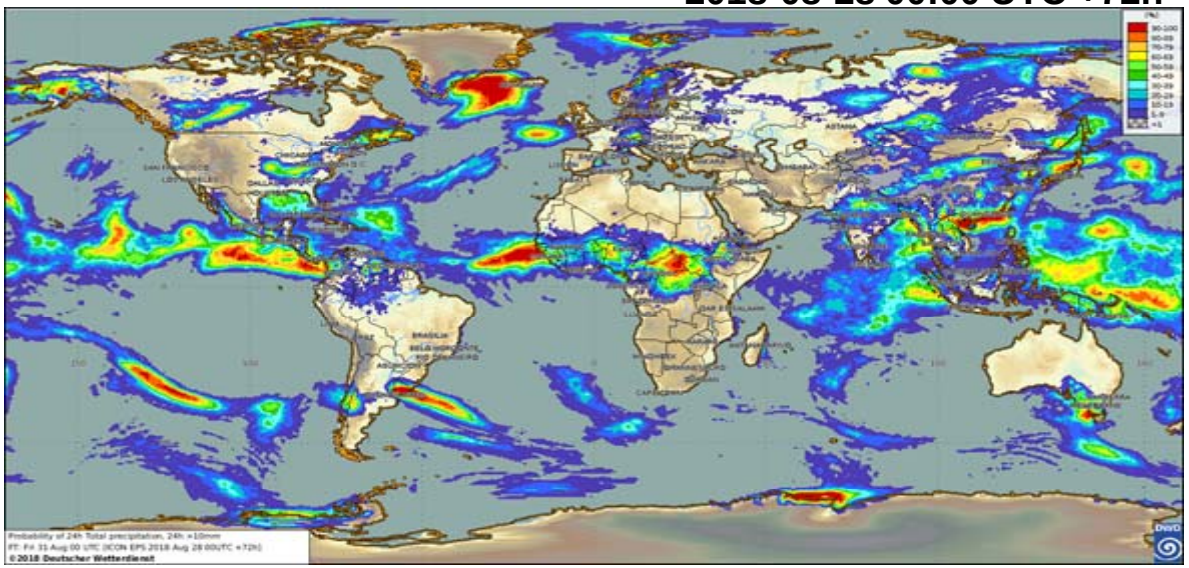
2. Percentiles

i.e. physical values of a forecast parameter (e.g. T_2M,. . .), which define the perc=10,25,50,75,90 [%] parts of the ensemble distribution.

3. Exceedance Probabilities

- Probability of event above lower limit
- Probability of event below upper limit

24h Probability of Precipitation >10mm
2018-08-28 00:00 UTC +72h



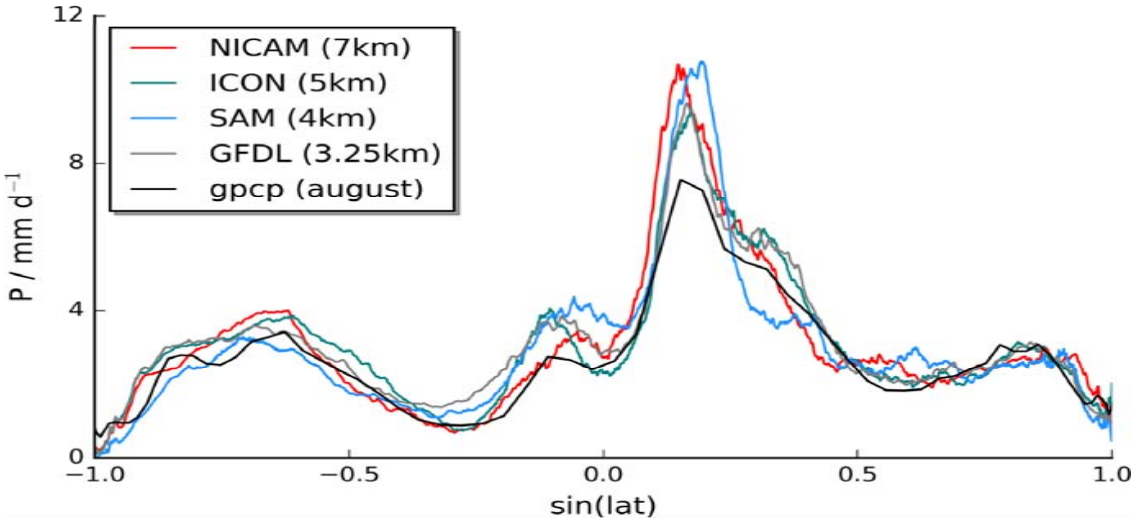
DYAMOND

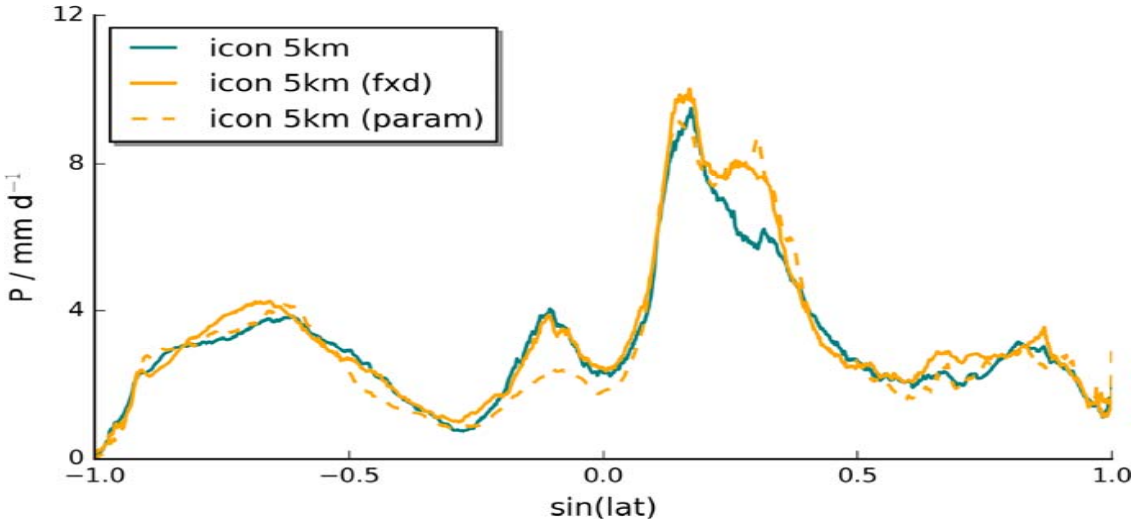
Daniel Klocke

DYAMOND movies

https://www.youtube.com/channel/UC_rSJlMflwwEqaXJHCklXuQ

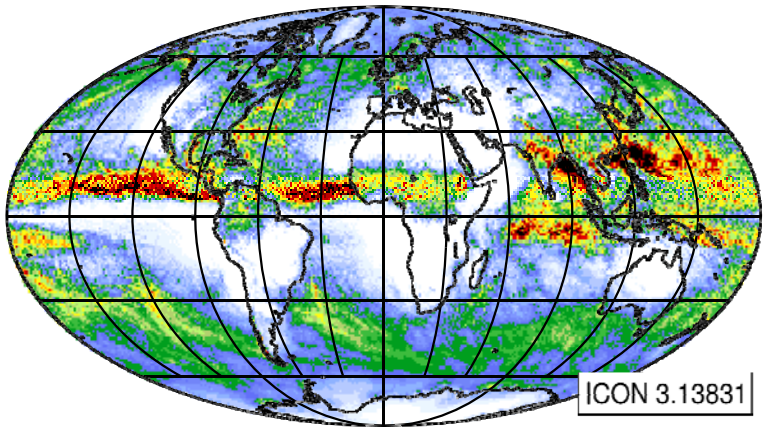
40 day averaged zonal mean precipitation

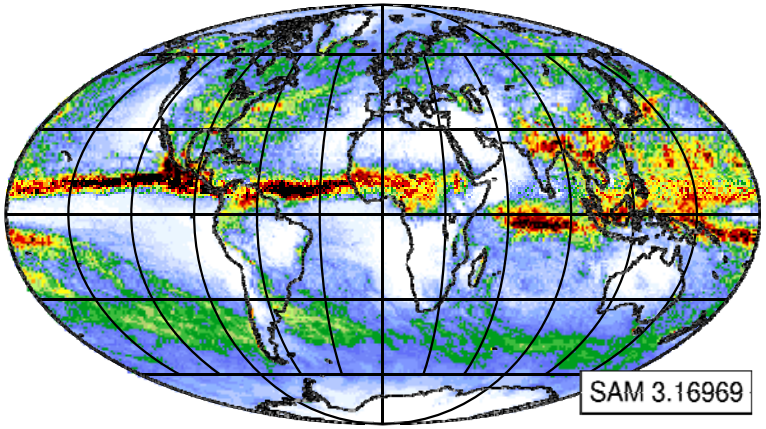


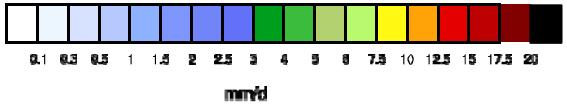


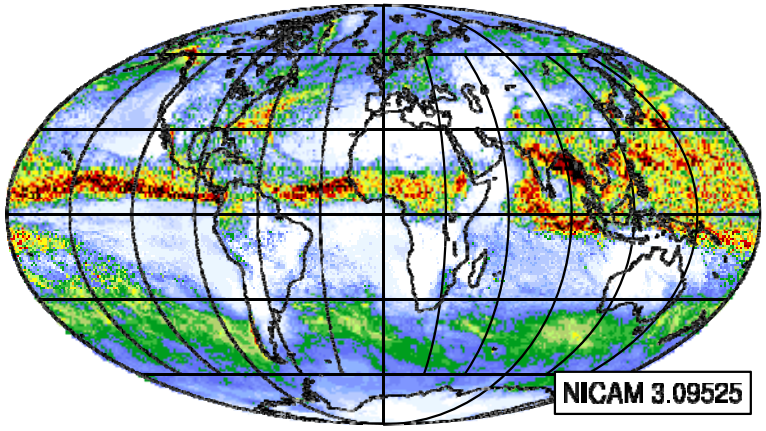
Bjorn Stevens (MPI) and Daniel Klocke (DWD)

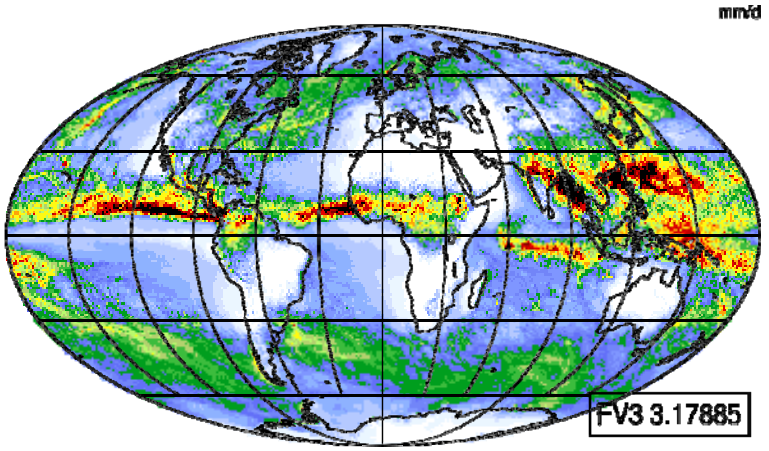
40 day averaged precipitation





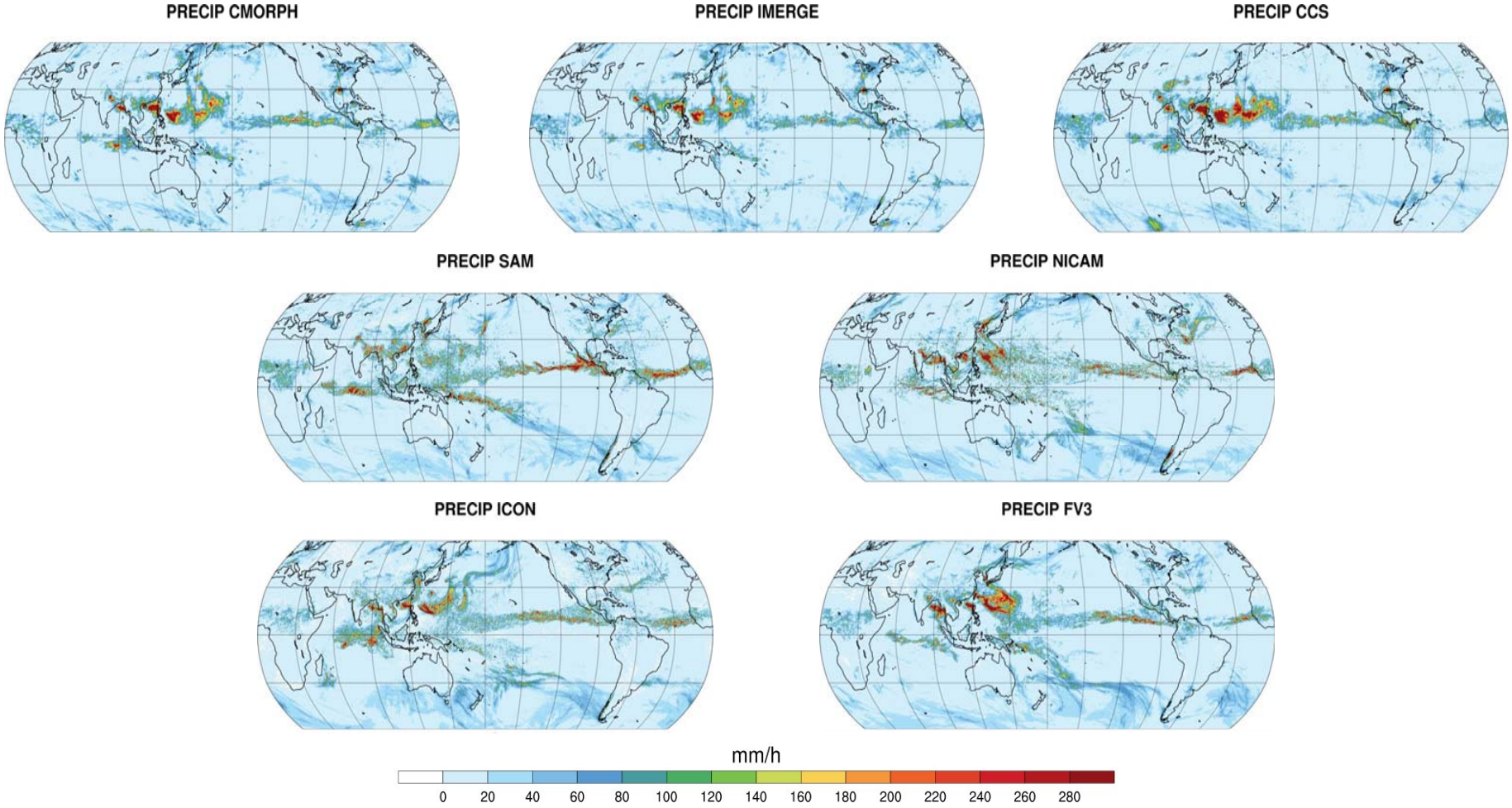






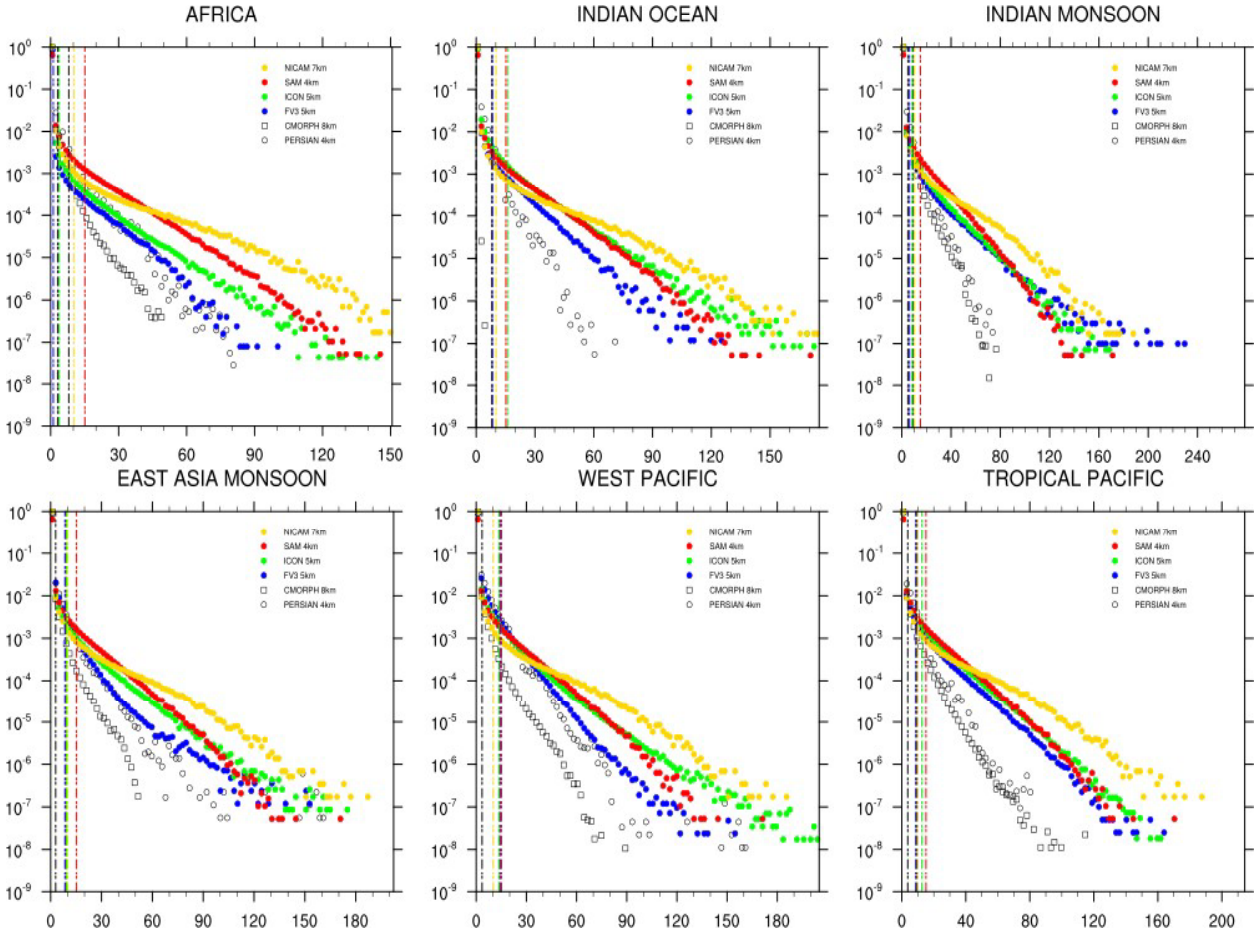
Bjorn Stevens (MPI) and Daniel Klocke (DWD)

Total precipitation 11 Aug 2016 to 16 Aug 2016



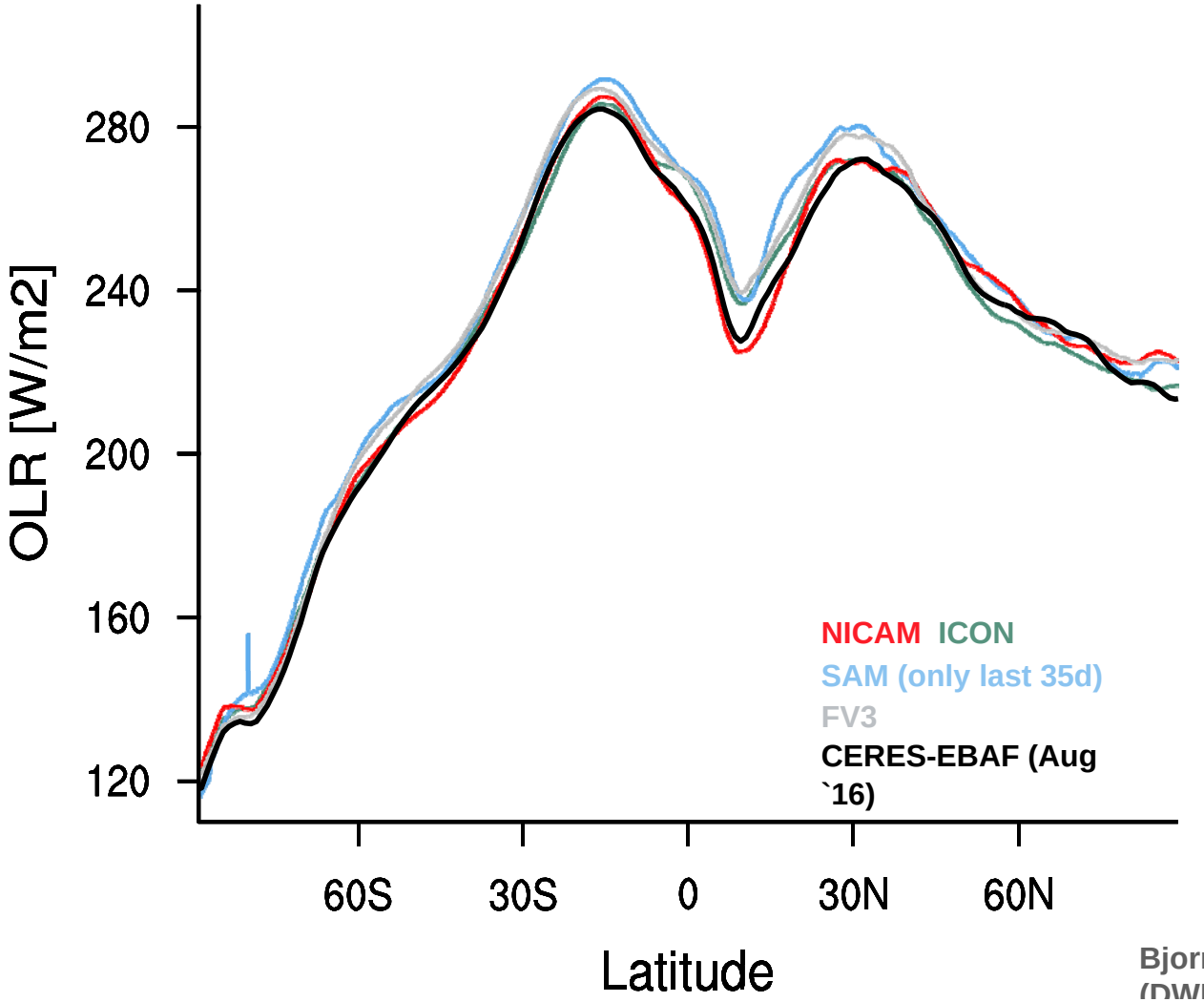
Christopher Mosley, Chao Li (MPI), Kameswarrao Modali and Shabeh Hasson (UniHH)

Hourly precipitation PDFs for 6 regions (11 Aug 2016 - 16 Aug 2016)



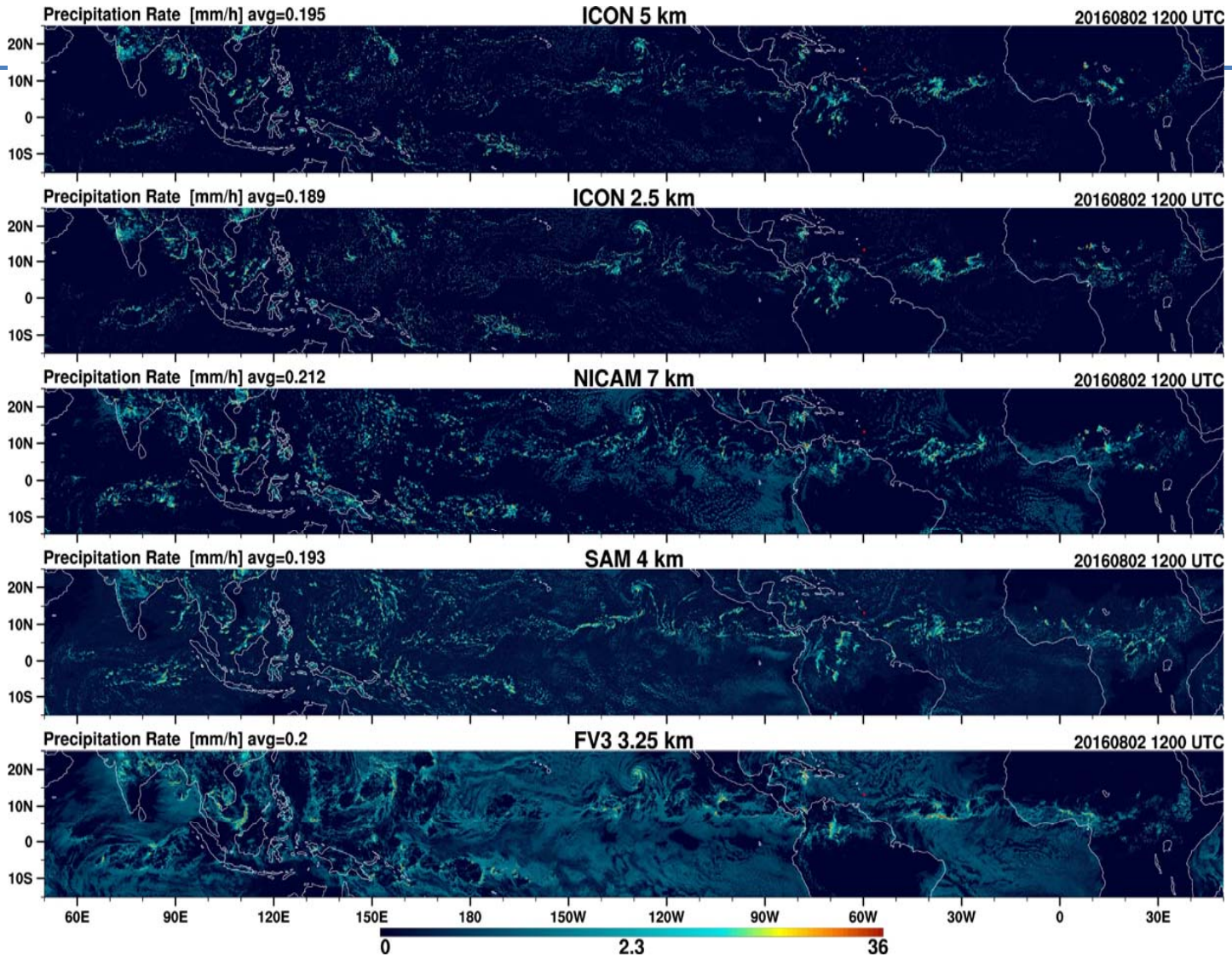
Christopher Mosley, Chao Li (MPI), Kameswarrao Modali and Shabeh Hasson (UniHH)

40 day averaged zonal mean
OLR



Bjorn Stevens (MPI) and Daniel Klocke (DWD)

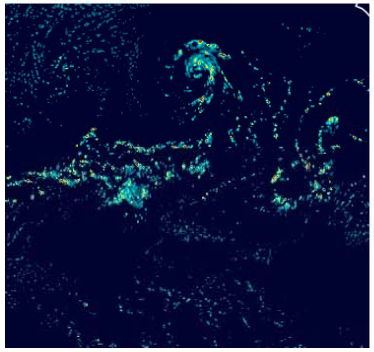
Tropical belt after 36h forecast time



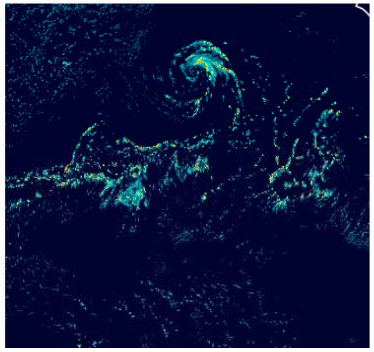
Matthias Brueck
(MPI)

Zoom on tropical storm ‚Howard' after 36h forecast time

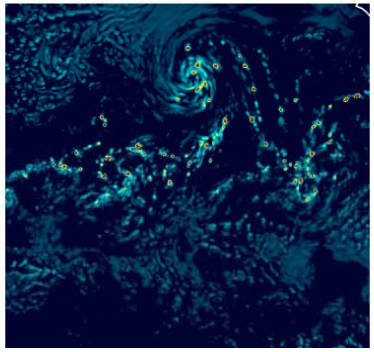
ICON 5 km



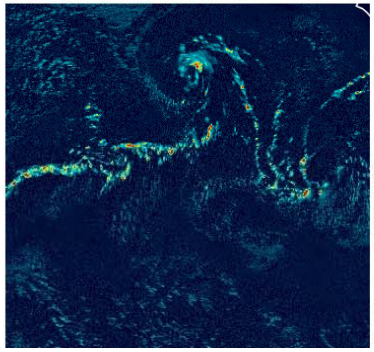
ICON 2.5 km



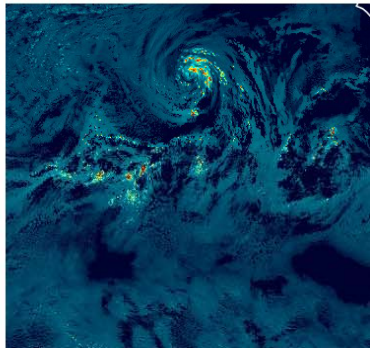
NICAM 7 km



SAM 4 km



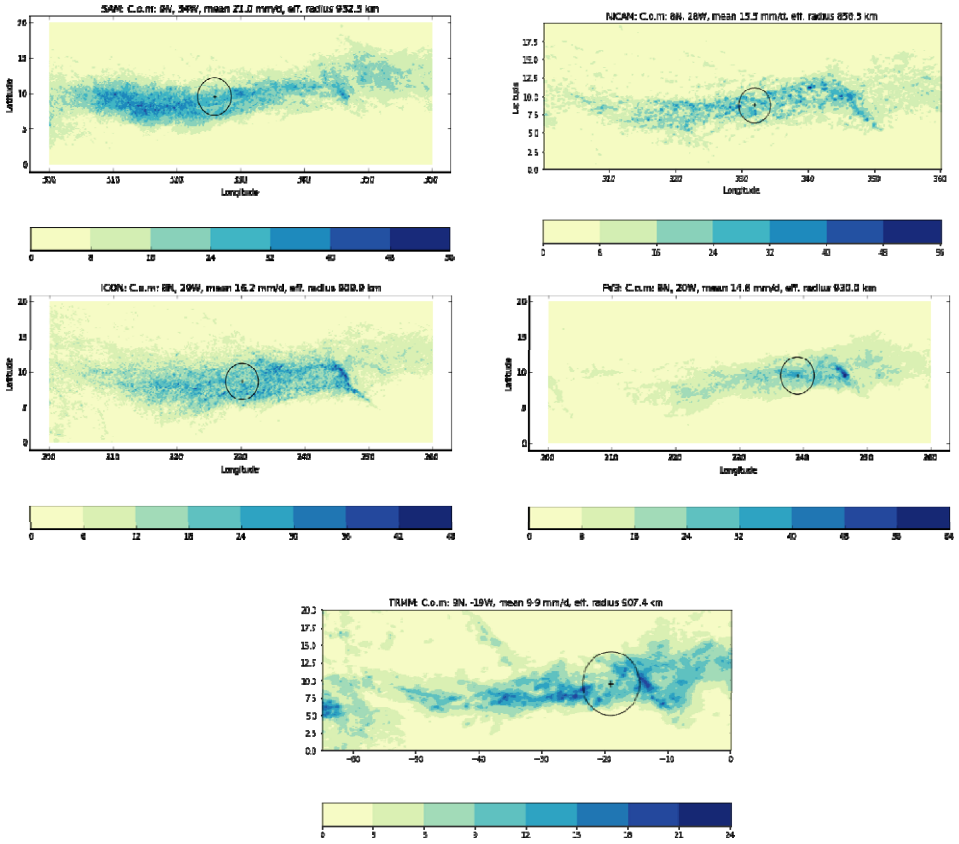
FV3 3.25 km

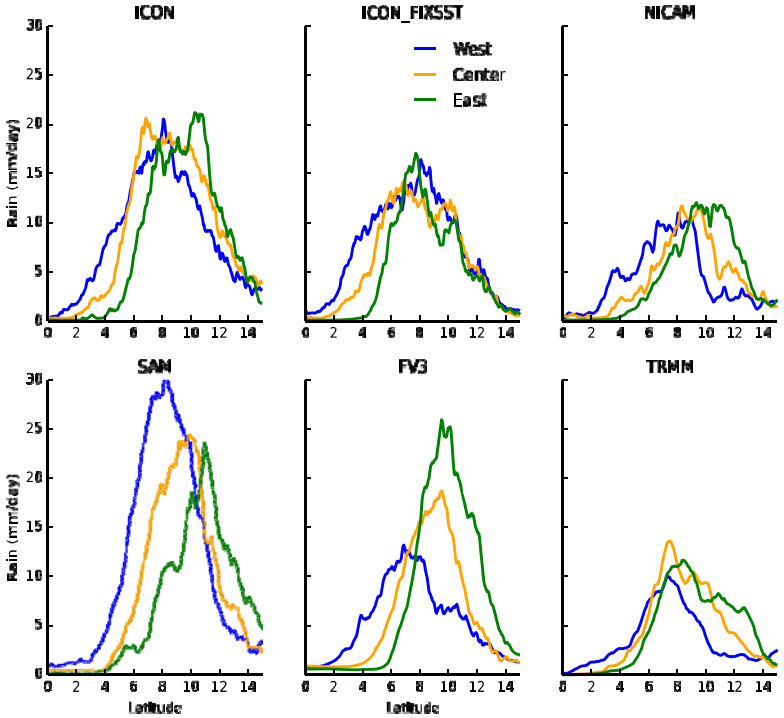


NASA worldview

Matthias Brueck (MPI)

Atlantic ITCZ





The Atlantic ITCZ is divided in to three sections: The 40 day average zonal mean precipitation in the West (35W-45W), Center (25W-35W) and East (15W-25W) section for five simulations and satellite data.

40 day averaged precipitation (August for TRMM) from the DYAMOND simulations. The ITCZ was identified as precipitation cluster (using the 80% percentile) and the mass centre is marked with a cross. The size of the circle is proportional to the area covered by the cluster.

Julia Windmiller and Jakob Dörr (MPI)

Data is arriving, two groups are done with their highest resolution run and data is transferred to DKRZ (FV3 and SAM)

The handling of the data, grids, variables is manageable (with a little patience) Confirmed that all models really started on the same day through snap shots ;)

The simulated mean precipitation and OLR structures are comparable among models

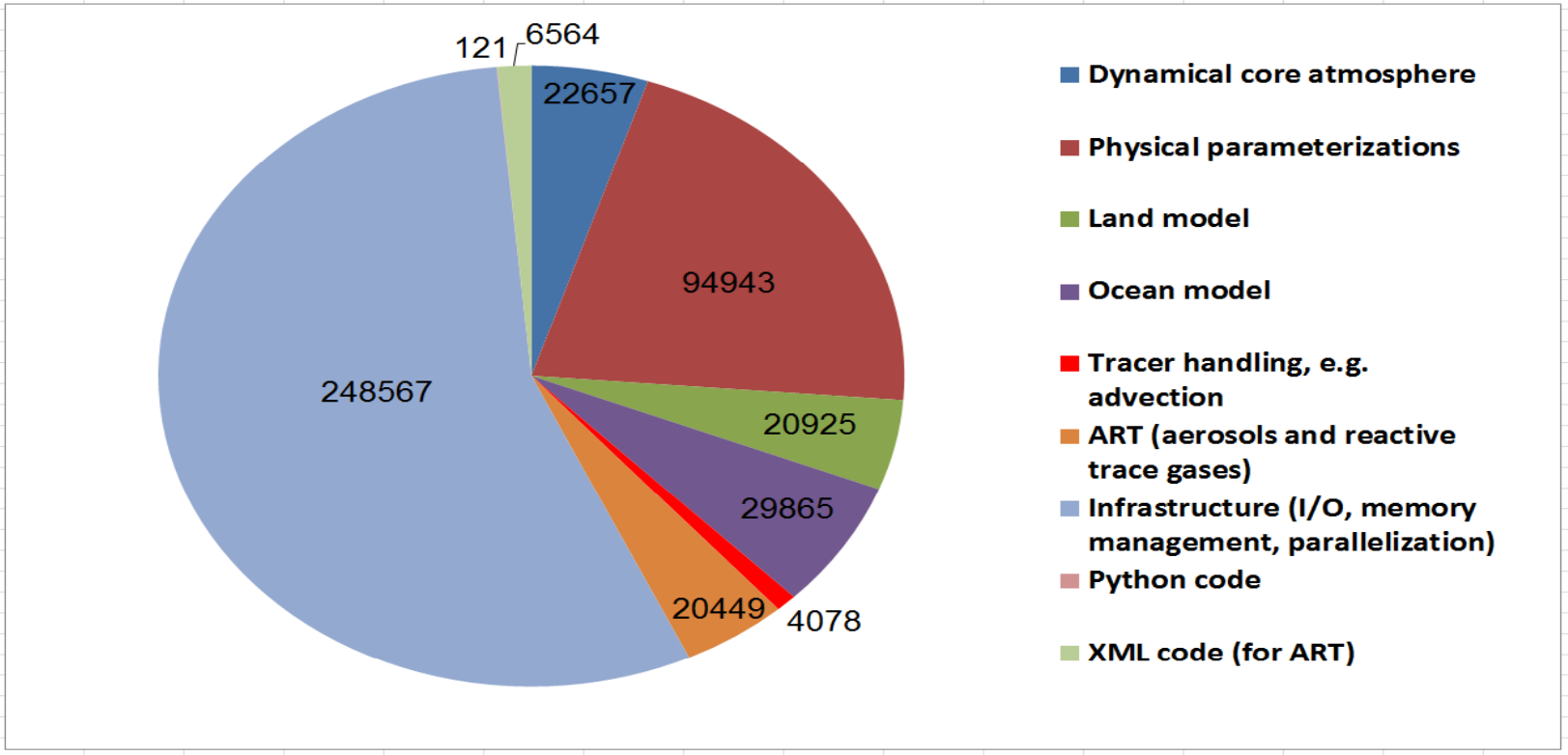
Global mean values agree surprisingly well among models, despite none of the models was tuned

Global mean precipitation in models is higher than in GPCP (consistent with past inferences that GPCP underestimates precip.) Some prominent differences in:

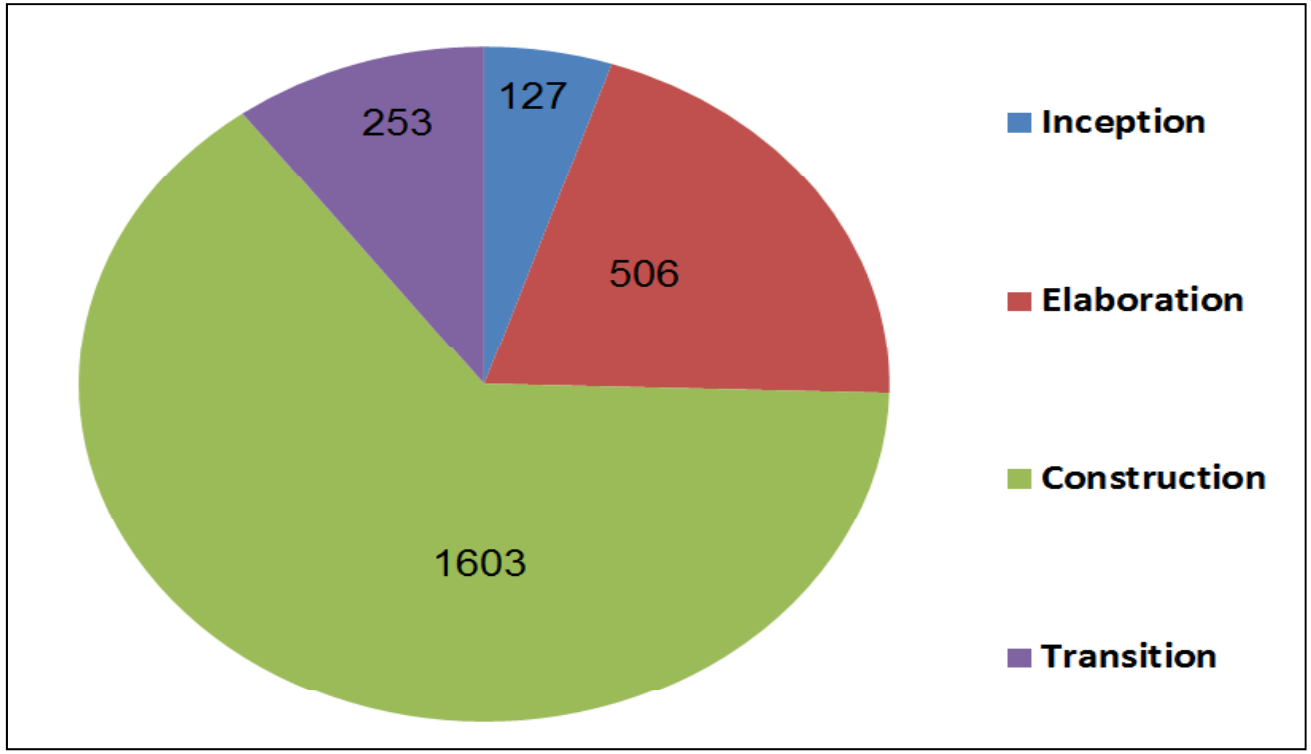
-the representation of the Atlantic ITCZ (only FV3 places the precip max to the east of the Atlantic basin, where it should be)
-the interaction with topography seems to be different in SAM (reflected in the Indian monsoon)
-ice clouds over the warm pool (few/lower in ICON, many/higher in NICAM, SAM and FV3 in between)
-Indian ocean precipitation
-dry regions over the oceans (higher rain rates in FV3, likely related to parameterized shallow convection)

ICON D2 vs COSMO D2

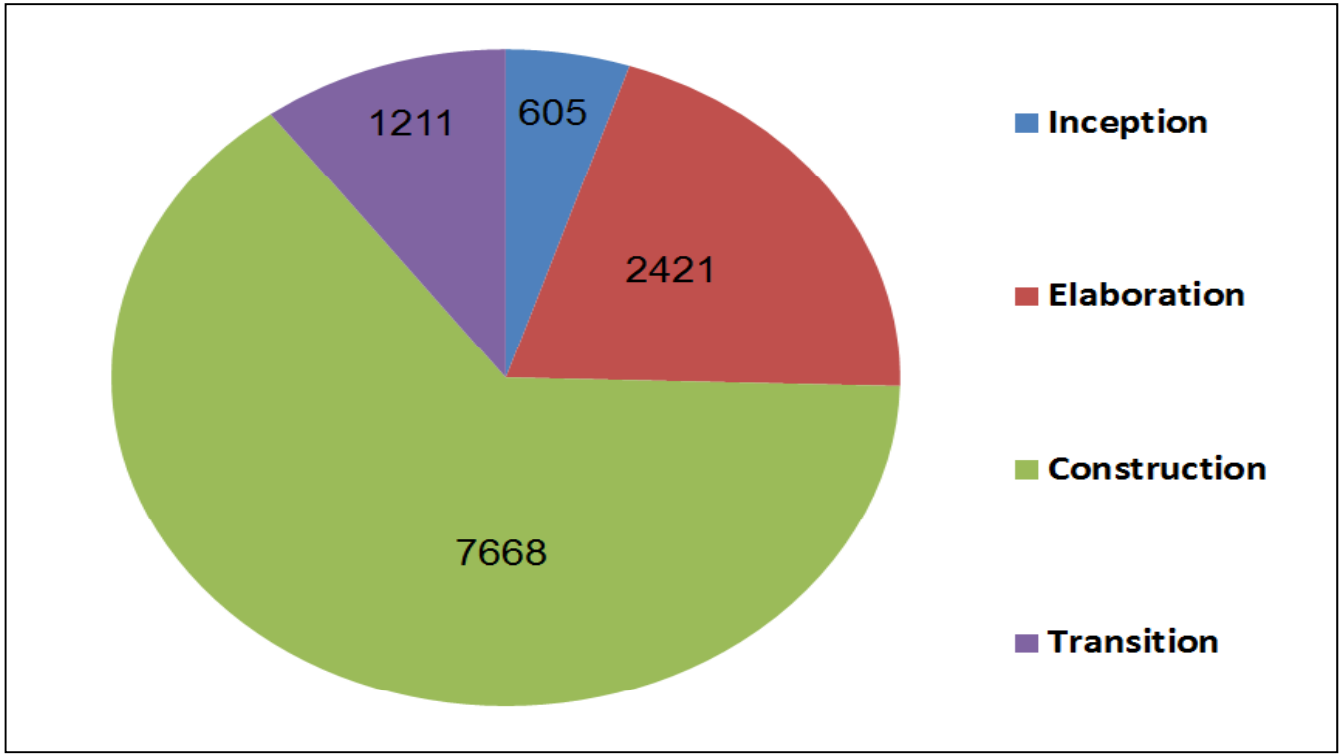
Detlev, Daniel Rieger



Global / regional seamless ICON-Modelling Framework
Logical lines (code statements) as of August 2018



Global and regional seamless ICON-Modelling Framework
Estimated cost of code development in PM (2004-2018)
Based on the Constructive Cost Model (COCOMO)



Global and regional seamless ICON-Modelling Framework
Estimated cost of code development in kEuro (2004-2018)
Based on the Constructive Cost Model (COCOMO)

ICON features which are important for COSMO

- Mass conservation, mass consistent tracer advection
- Stable dycore for steep terrain
- Up-to-date physics packages, e.g. RRTM, tile approach
- One-way and two nesting options available
- Hybrid MPI / OpenMP parallelization, highly scalable and efficient
- ICON-model is between 30 to 50% faster than COSMO-model
- Consistent initial and lateral boundary data based on global ICON-model
- Further development and support by DWD, MPI-M, KIT and DKRZ

Points of concern for COSMO

- ICON software requires more modern HPC software stack and is more complex to compile than the COSMO-model software
- ICON software (not yet) ported to GPUs
- No nudging data assimilation available for ICON; initial state either based on local Ensemble Data Assimilation (KENDA) or local 3D-Var with flow-dependent B-matrix (from DWD ICON-EPS)
- Quality of ICON-LAM vs. COSMO-model forecasts not yet evaluated for each COSMO partner
- No official duty licenses available as of now for NHMS in developing (planned for 2019) and developed (planned for 2020) countries

ICON D2
Günther

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Status und weitere Planung für den Umstieg von COSMO-D2(-EPS) auf ICON-D2-(EPS)

Günther Zängl

KGNWV, 29.08.18

Gliederung

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

- **Aktueller Status der Arbeiten**
- **Fallstudien zum Vergleich COSMO-D2 / ICON-D2**
- **Verifikationsergebnisse aus vorbereitenden Testsuiten**
- **Weiterer Zeitplan**

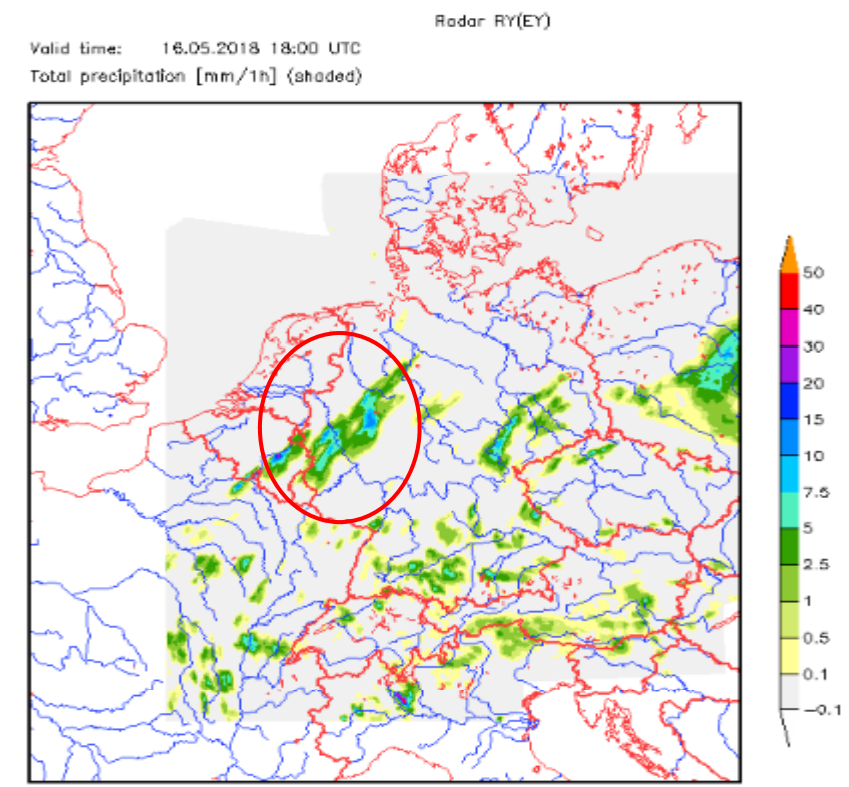
Fallstudien

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

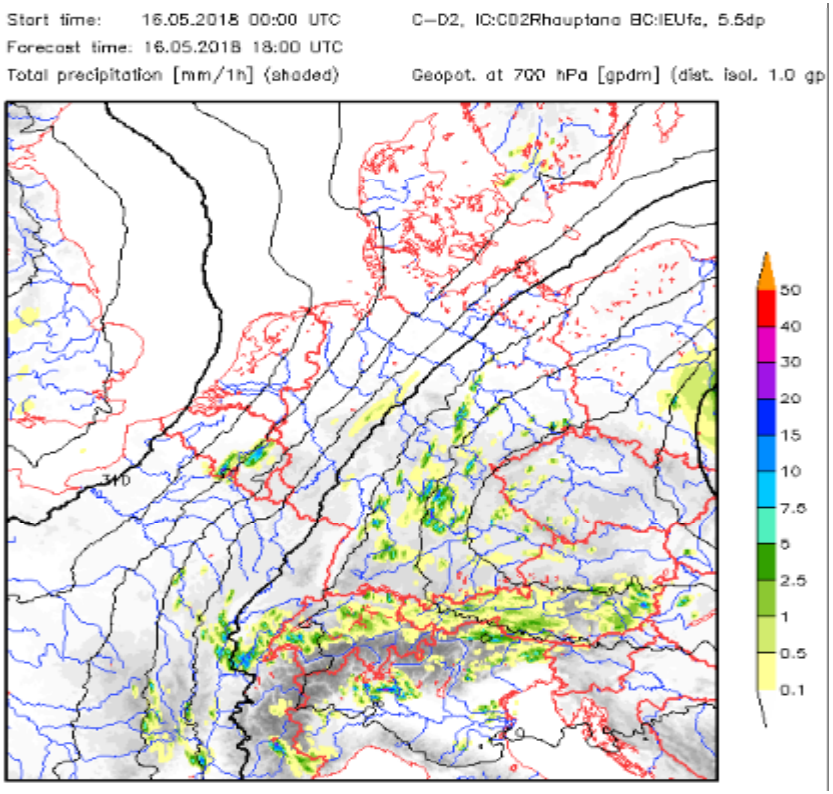
- **Auswahl von Fällen, in denen die operationelle COSMO-D2-Vorhersage Schwächen zeigte, die zu Kritik aus WV führten**
- **Im folgenden werden vorgestellt:**
- **Viersen-Tornadofall, 16.05.18**
- **Zu starke Seewindzirkulation / zu starke Böen in NW-Deutschland, z.B. 24.07.18**

Viersen-Tornadofall

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



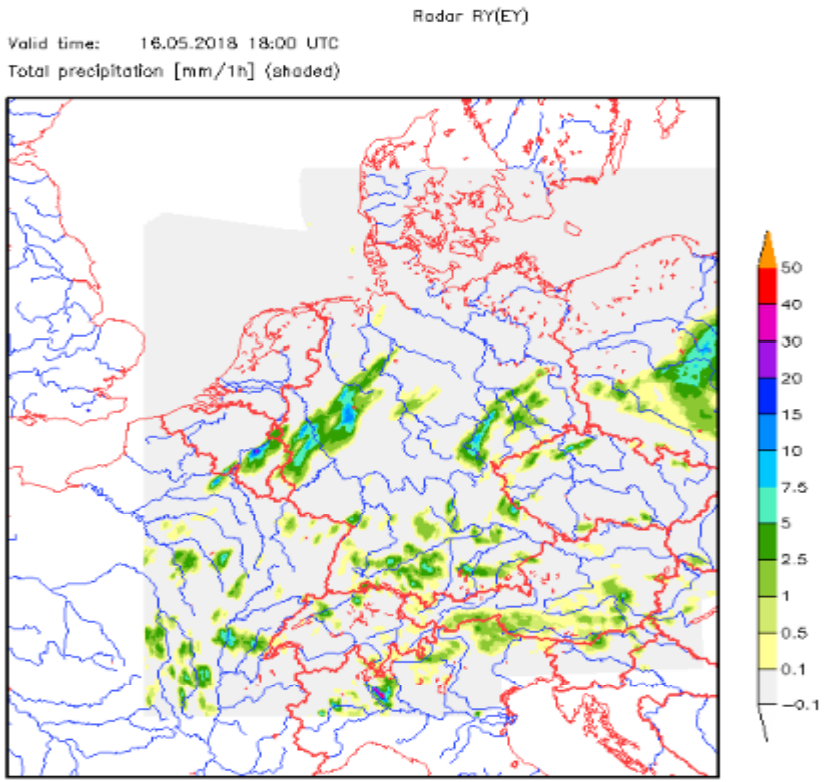
stdl. Radarniederschlag, 18 UTC



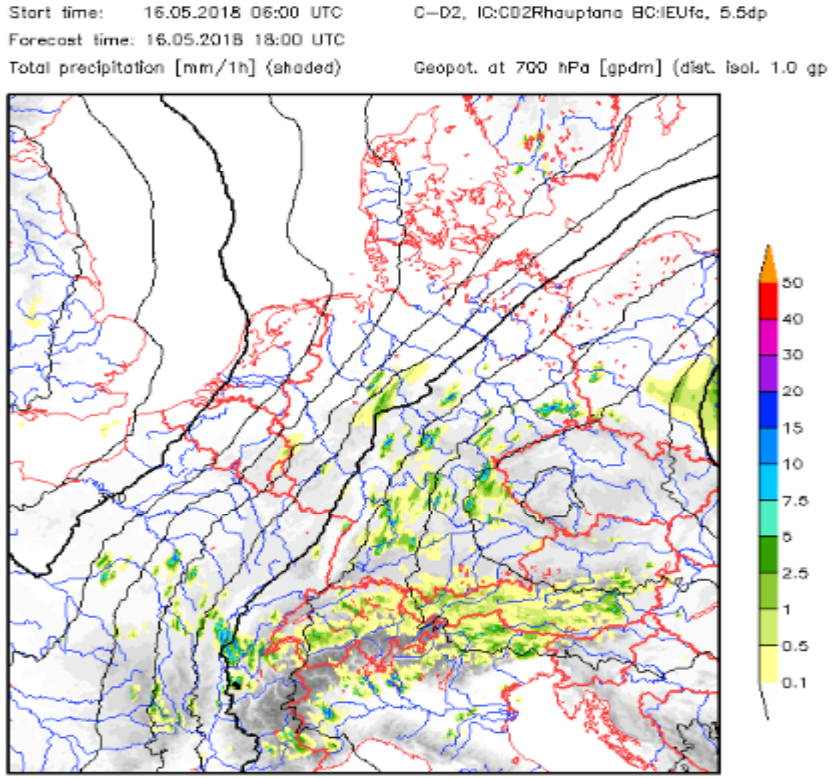
COSMO-D2, oper. 00-UTC-Lauf

Viersen-Tornadofall

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



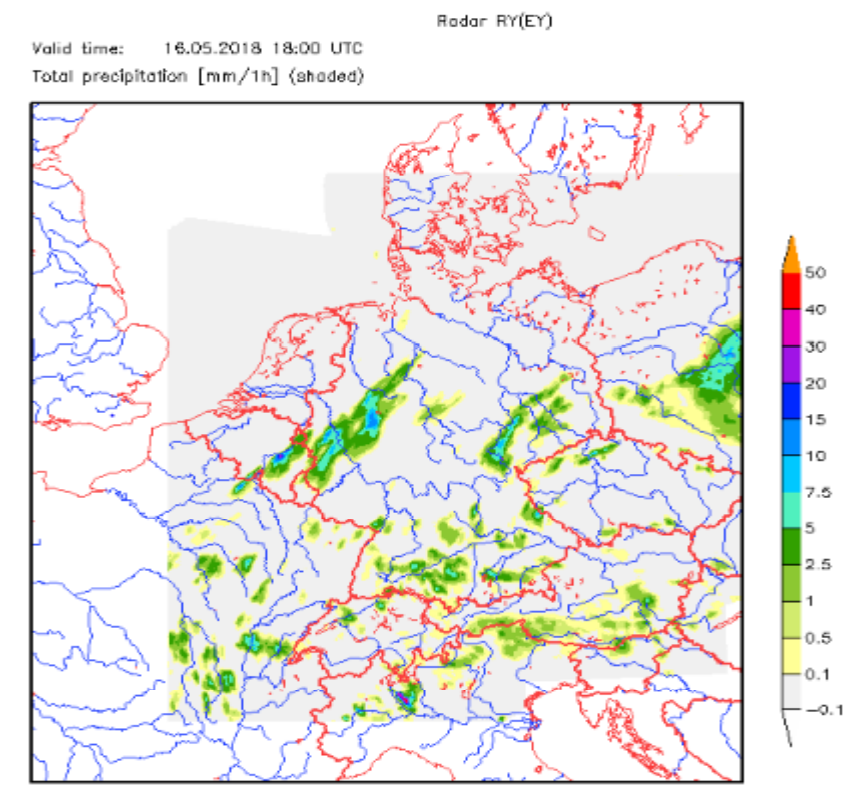
stdl. Radarniederschlag, 18 UTC



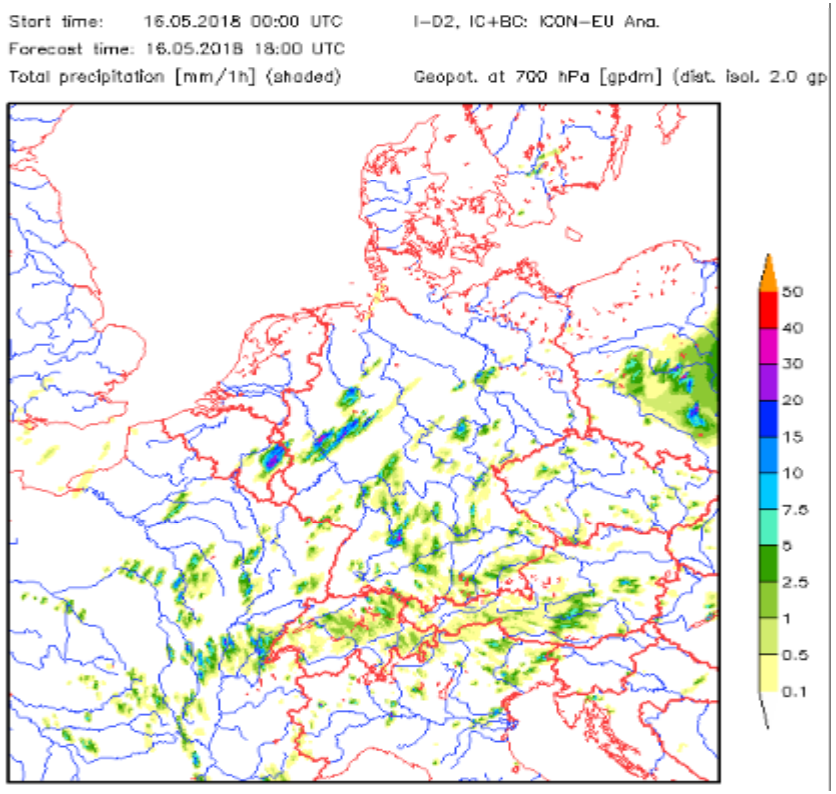
COSMO-D2, oper. 06-UTC-Lauf

Viersen-Tornadofall

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



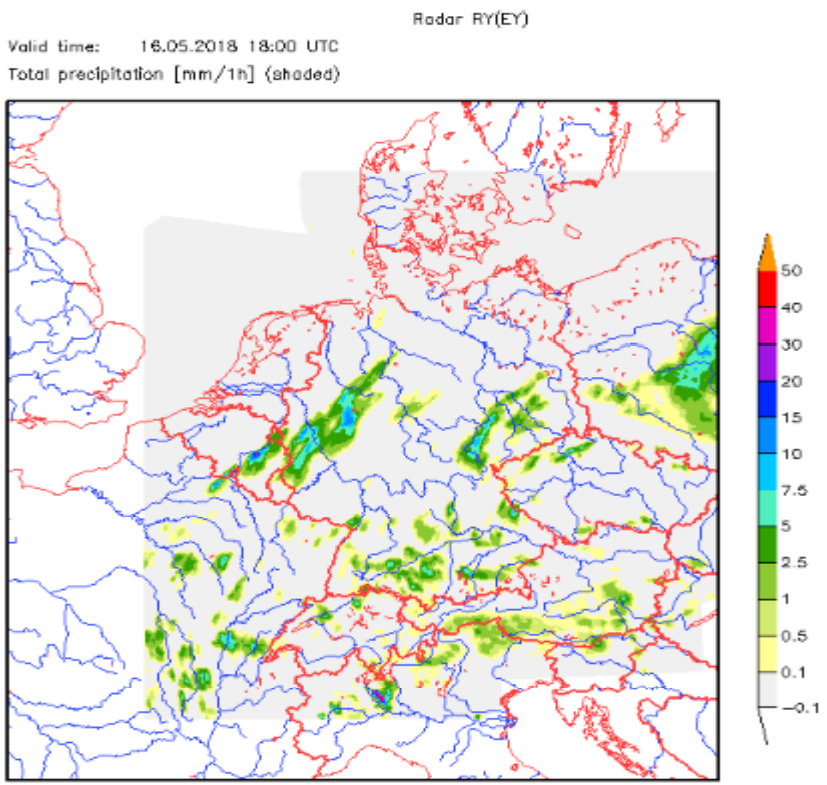
stdl. Radarniederschlag, 18 UTC



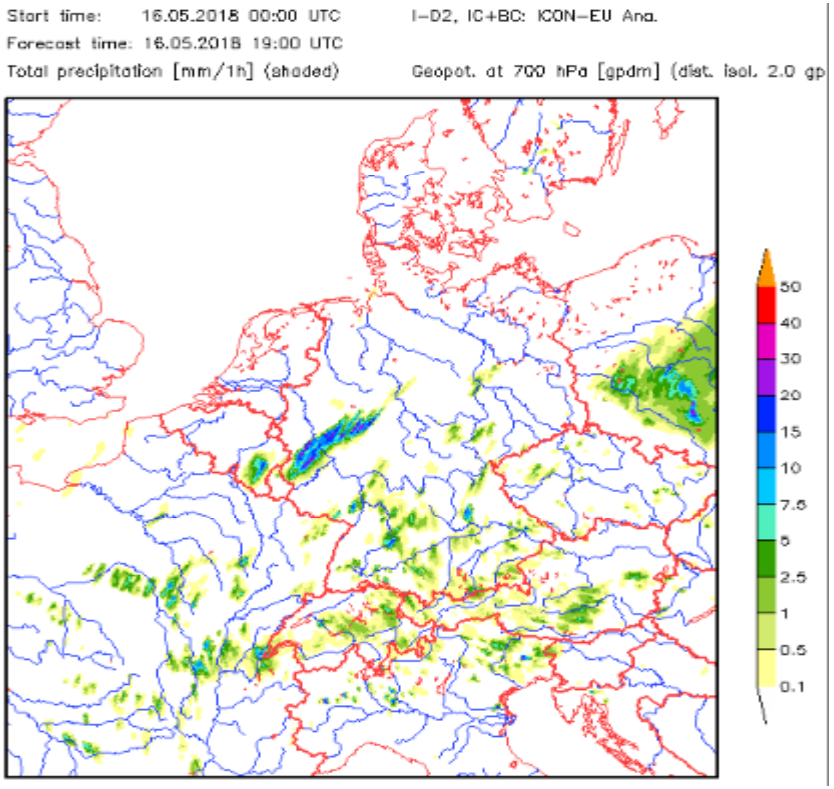
ICON-D2, 00-UTC-Lauf, gestartet von interpolierten ICON-EU-Analysen

Viersen-Tornadofall

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



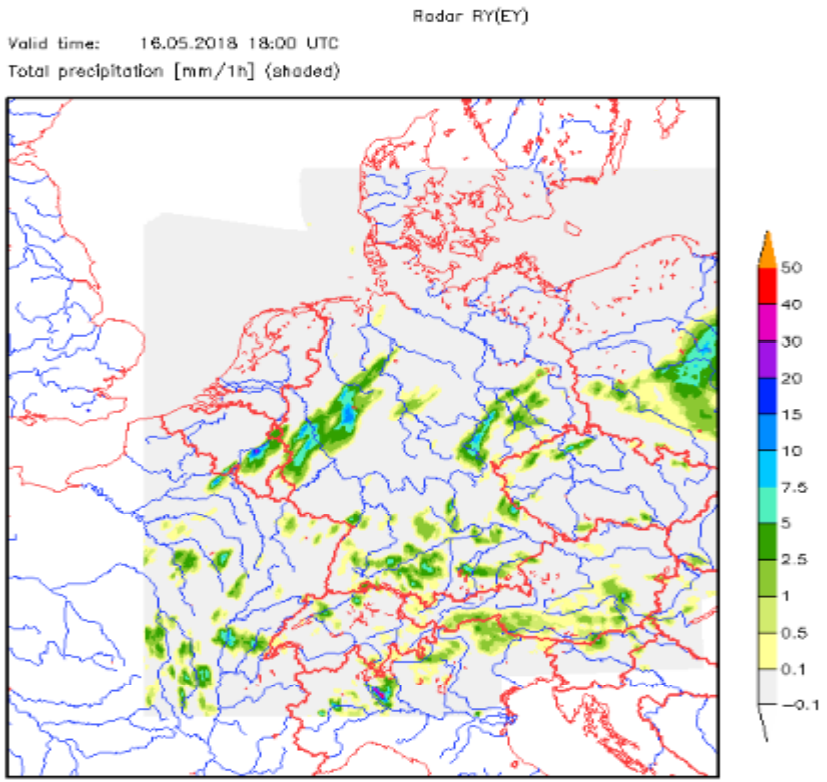
stdl. Radarniederschlag, 18 UTC



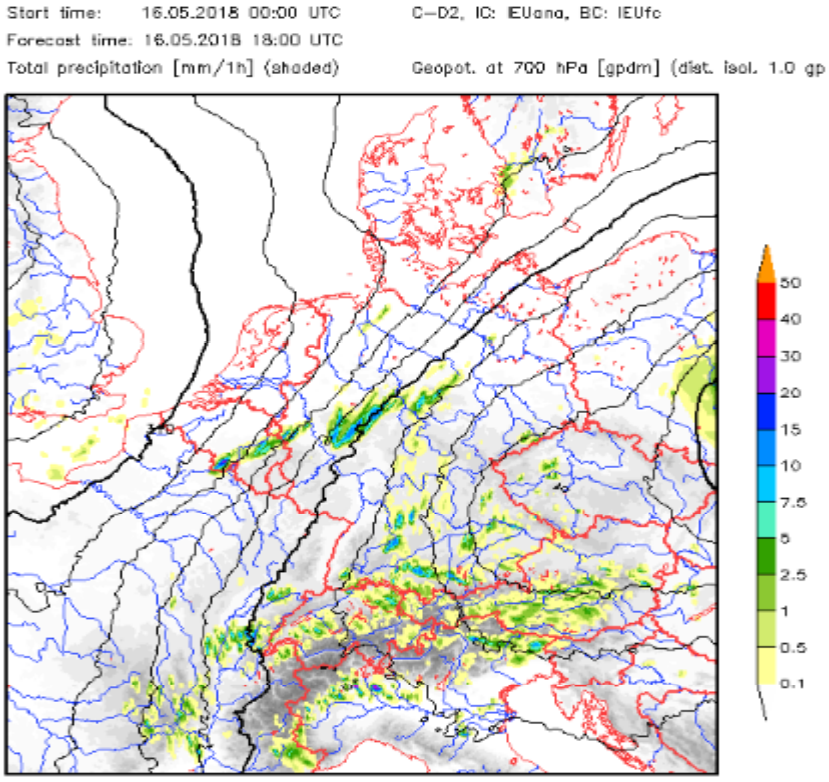
ICON-D2, 00-UTC-Lauf, Vorhersage für 19 UTC (d.h.1h später)

Viersen-Tornadofall

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



stdl. Radarniederschlag, 18 UTC



COSMO-D2, 00-UTC-Lauf, gestartet von interpolierten ICON-EU-Analysen

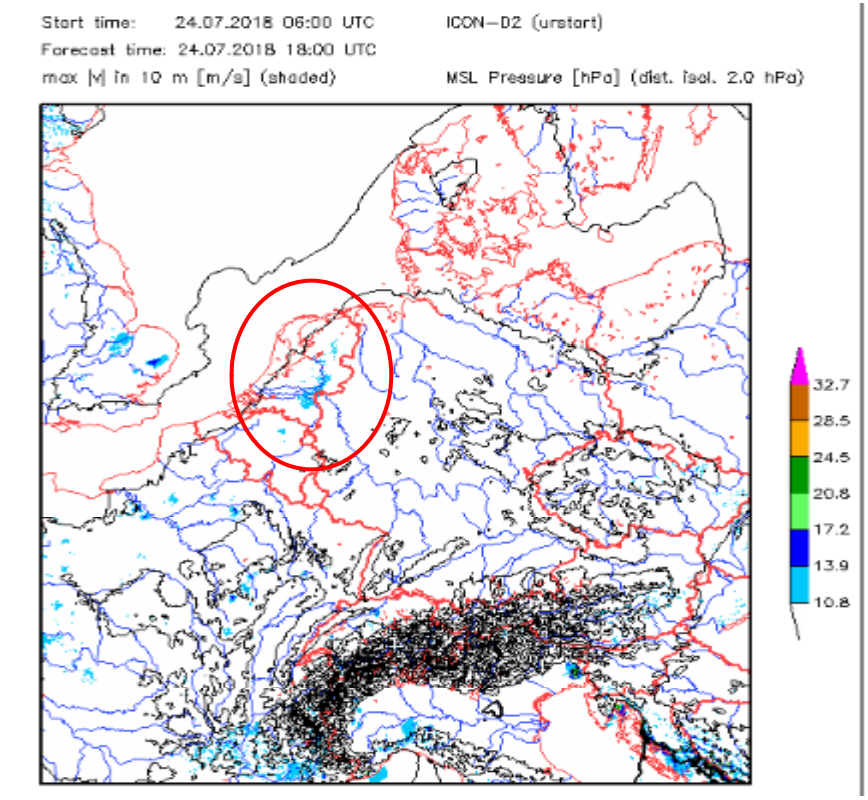
Viersen-Tornadofall: Fazit

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

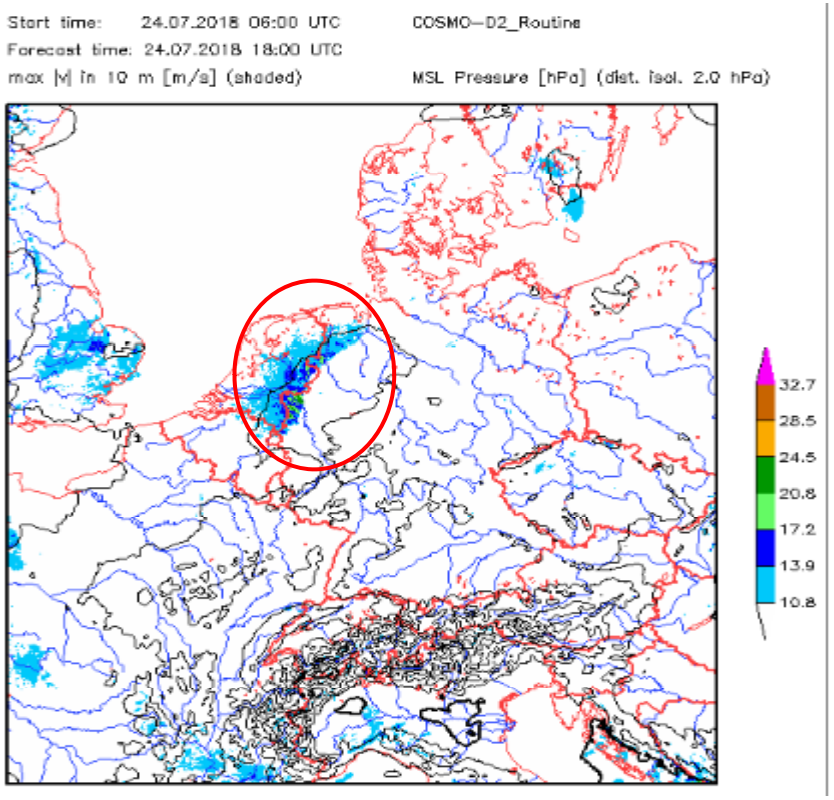
- **In den operationellen COSMO-D2-Vorhersagen fehlte das mesoskalige konvektive System über Westdeutschland weitgehend**
- **Im ICON-D2 wird die Entwicklung hingegen recht gut getroffen**
- **Interessanterweise lieferte das COSMO-D2 mit interpolierten ICON-EU-Analysen in diesem Fall eine deutlich bessere Vorhersage als mit der eigenen KENDA-Analyse. Dies ist ein Einzelfall!**

Seewindzirkulation NL/NRW

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



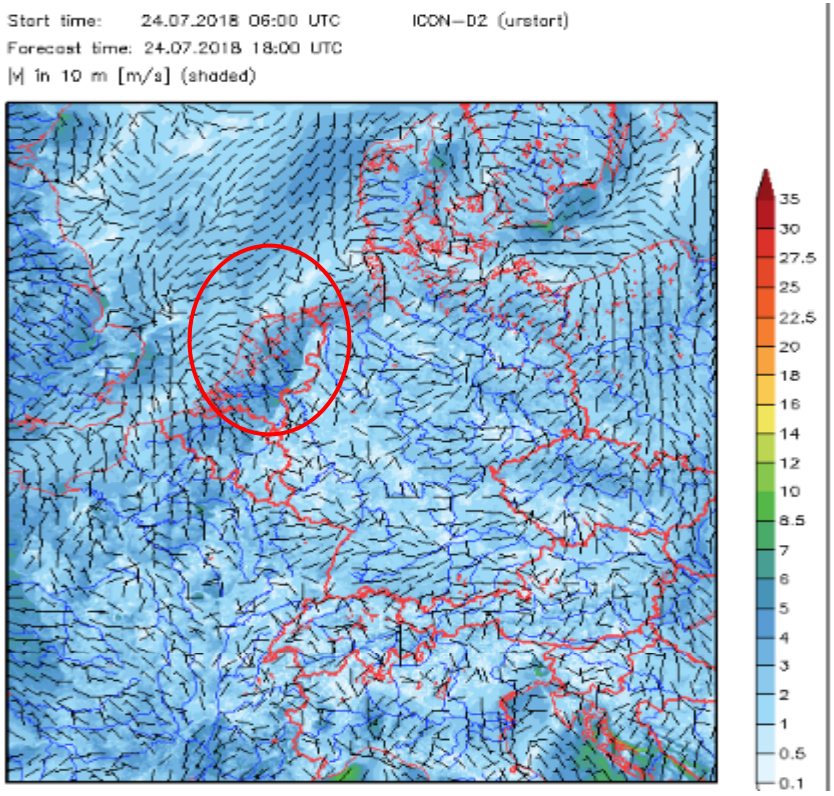
10m-Böen, ICON-D2



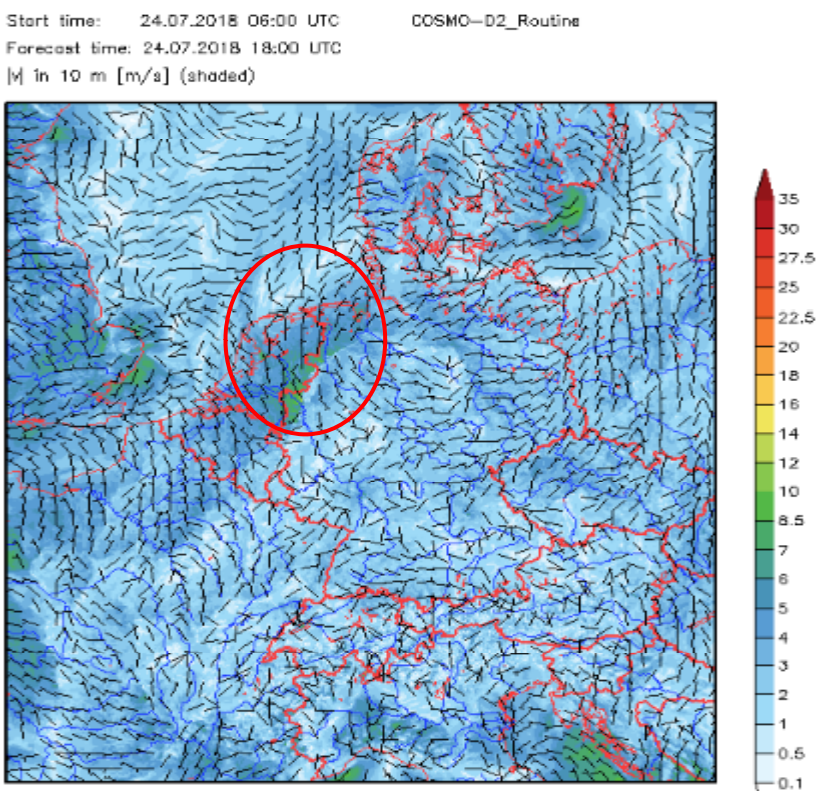
10m-Böen, COSMO-D2

Seewindzirkulation NL/NRW

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



10m-Wind, ICON-D2



10m-Wind, COSMO-D2

Seewindzirkulation NL/NRW: Fazit

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

- **Die in einer WV2-Kundenbeschwerde kritisierte Überschätzung der 10m-Winde bzw. Böen im Rahmen der Seewindzirkulation über den Niederlanden / NW-Deutschland tritt im ICON-D2 nicht auf**
- **Auch die Verlagerungsgeschwindigkeit der Seewindfront ist im ICON-D2 realistischer als im COSMO-D2**
- **Sensitivitätstests zeigten, dass ein Beitrag zu den Unterschieden von Verbesserungen im Bodenmodell TERRA herrührt. Diese führen jedoch zu so gravierenden Änderungen im Modellklima, dass sie nicht kurzfristig in den Routinebetrieb übernommen werden können**

ICON World Meteorological Centre

Michael Denhard

M. Denhard, A. Rhodin, J. T. Ambadan, H. Anlauf, A. Fernandez del Rio, A. Cress, G. Zängl, H. Frank, T. Hanisch, C. Primo, F. Fundel, M. Buchhold, R. Potthast

ICON-EPS

operational suite (since 18th January 2018)

- 40 Member
- Global, 40 km / ICON-EU Nest, 20 km
- **00/12 UTC → +180h / 06/18UTC → +120h**
- **03/09/15/21 UTC → +30h** Boundary Conditions for COSMO-DE-EPS
- Perturbing physics tuning parameters (fixed during the forecast)
- Initial condition perturbations by global EDA (LETKF)

Operational ICON-EPS products with fieldextra

Global: 0,5° opendata.dwd.de : weather/wmc/icon-eps

www.dwd.de/DE/leistungen/wmc/wmc.html

EU: 0,25° charts available in NinJo at DWD

new: Probability of Turbulenz (EDPP)

1. Mean and extreme values

- Unweighted mean of all members
- Spread of all members
- Minimum of all ensemble members
- Maximum of all ensemble members

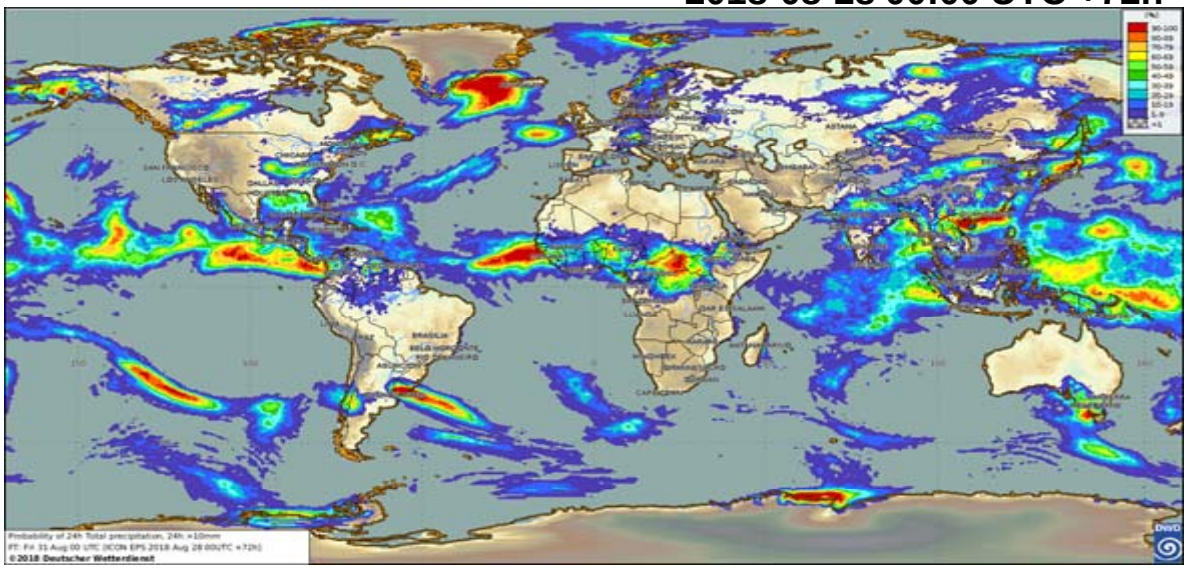
2. Percentiles

i.e. physical values of a forecast parameter (e.g. T_2M,. . .), which define the perc=10,25,50,75,90 [%] parts of the ensemble distribution.

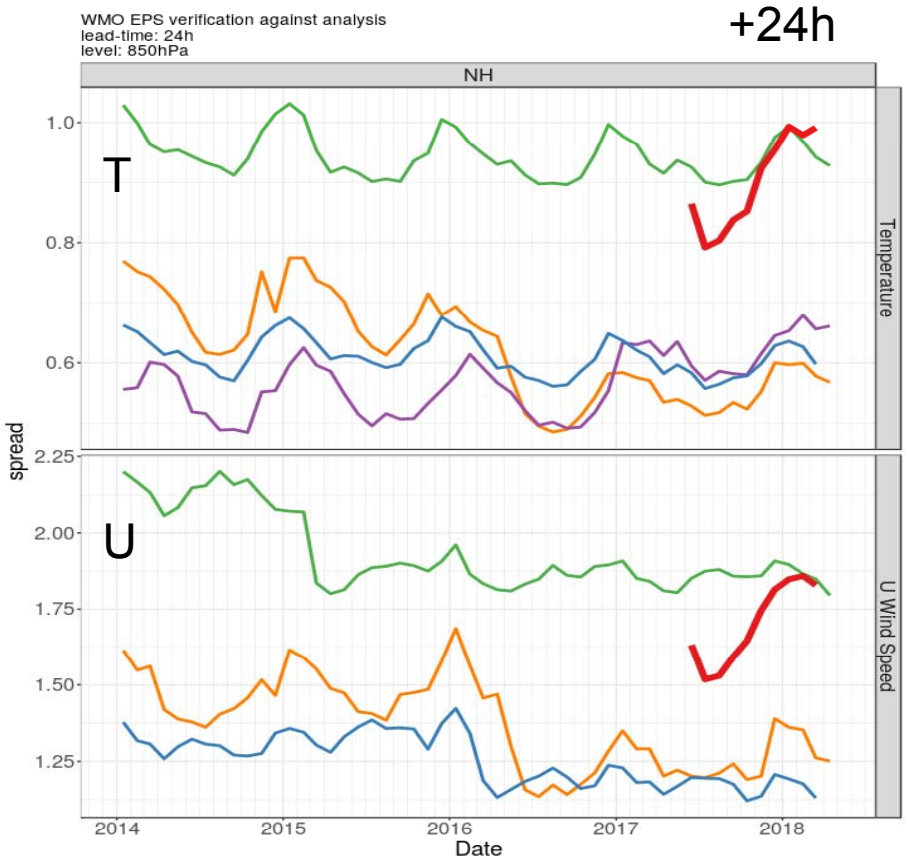
3. Exceedance Probabilities

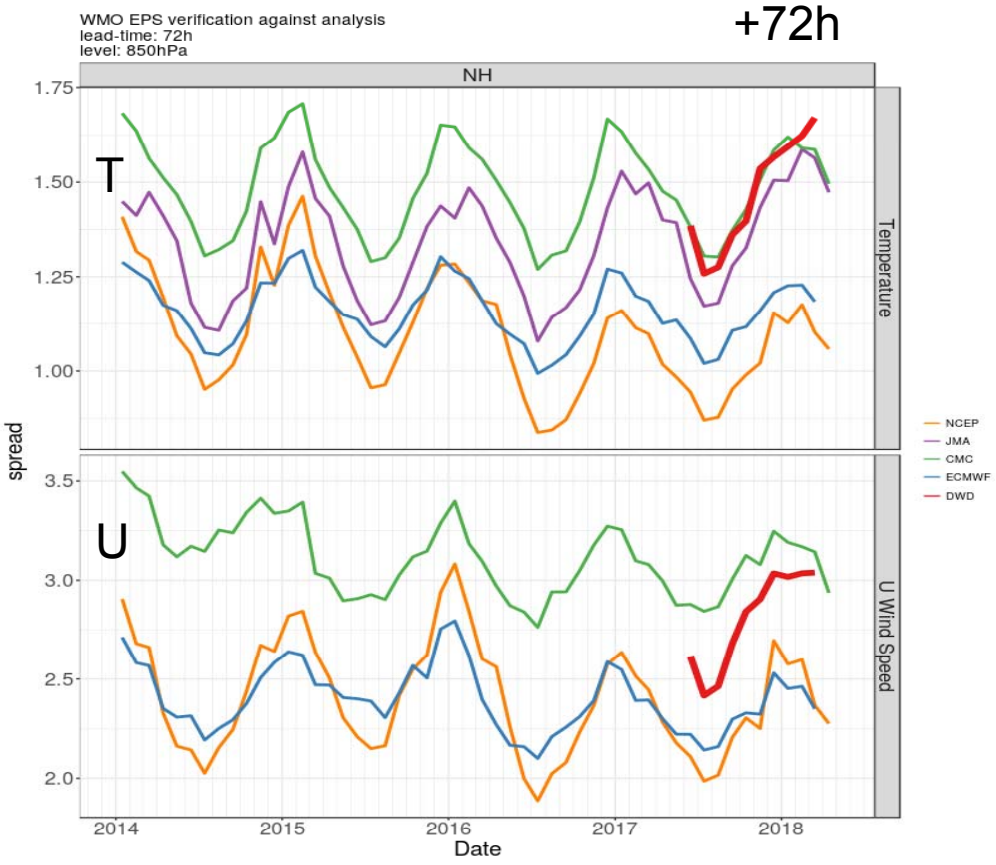
- Probability of event above lower limit
- Probability of event below upper limit

24h Probability of Precipitation >10mm
2018-08-28 00:00 UTC +72h

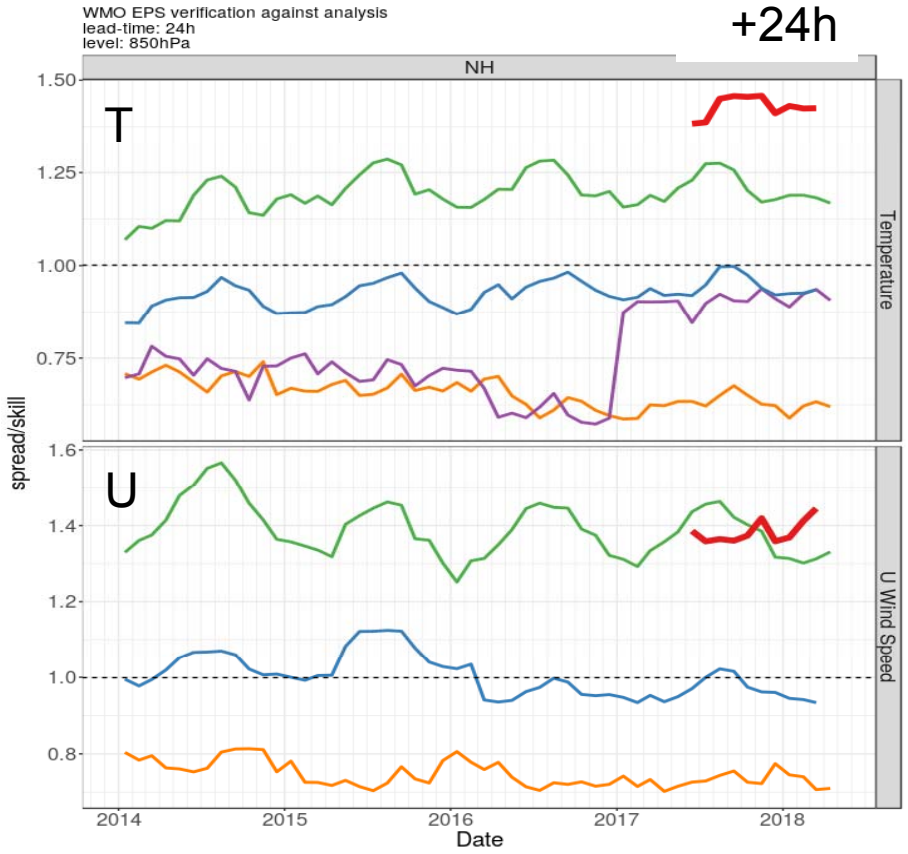


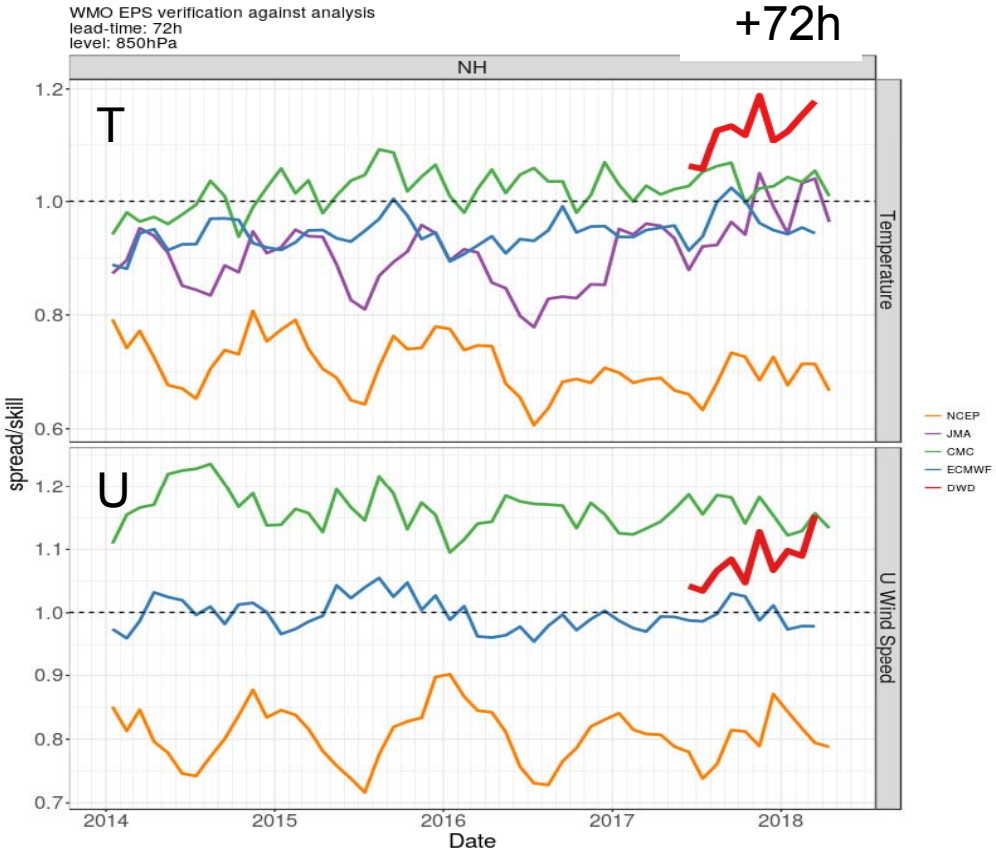
Spread = STDV


WMO EPS verification against analysis
lead-time: 24h
level: 850hPa
+24h
NH
T
U
Temperature
U Wind Speed
spread
Date
2014
2015
2016
2017
2018


WMO EPS verification against analysis
lead-time: 72h
level: 850hPa
+72h
NH
T
U
Temperature
U Wind Speed
spread
Date
NCEP
JMA
CMC
ECMWF
DWD

Spread Skill Ratio





Open Data

OpenData@DWD

Hintergrund, Herausforderungen, Perspektiven

Renate Hagedorn

Deutscher Wetterdienst

Produktentwicklung und Kundenkommunikation

DWD-Gesetz

- **Hintergrund**
  - Der DWD strebte seit langem die kostenfreie Abgabe seiner Daten an
  - Auseinandersetzung um WarnWetter-App brachte erneute Bewegung in diese Aktivitäten
- **Ablauf der Ereignisse**
  - April 2016: Erneuter Anlauf zur Änderung des DWD-Gesetzes
  - Nov 2016: Entwurf zur Anhörung von Gemeinden und Verbänden
  - April 2017: Anhörung des Verkehrsausschuss mit sechs Sachverständigen
    https://www.bundestag.de/blob/507040/d739a9ba68f6e4b594d40bdd3b20138d/109_sitzung_wortprotokoll-data.pdf
  - Mai/Juni 2017: weitere „politische Verhandlungen“ in sogenannten Berichterstattergesprächen und Verkehrsausschuss
  - Juli 2017: Finales Parlamentarisches Verfahren (3. Lesung, Bundesrat, Bundespräsident)

Was hat sich geändert?

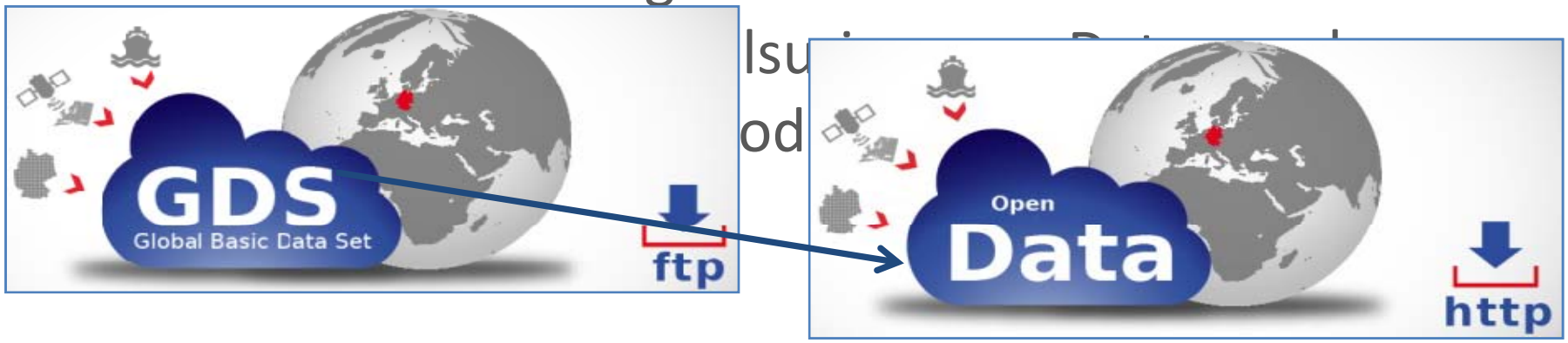
- **§ 4 (1): Aufgaben des DWD**
  - Erweiterung des Warnbegriffs:
    „öffentliche Sicherheit“, plus neu: „hohes Schadenspotenzial“
- **§ 4 (4): Unterstützung der Behörden**
  - Erweiterung von Länder auf Bund, Länder und Gemeinden
- **§ 4 (6): Verbreitung der Leistungen**
  - DWD darf Leistungen aus § 6 (2a) selbst verbreiten, soweit dies zu seinen gesetzlichen Aufgaben gehört
- **§ 6 (2a): Vergütungen**
  - Entgeltfreie Dienstleistungen:
    1. BLG nach § 4 (4)

https://www.buzer.de/gesetz/5998/v208423-2017-07-25.htm

DWD-Gesetz: Interpretationen

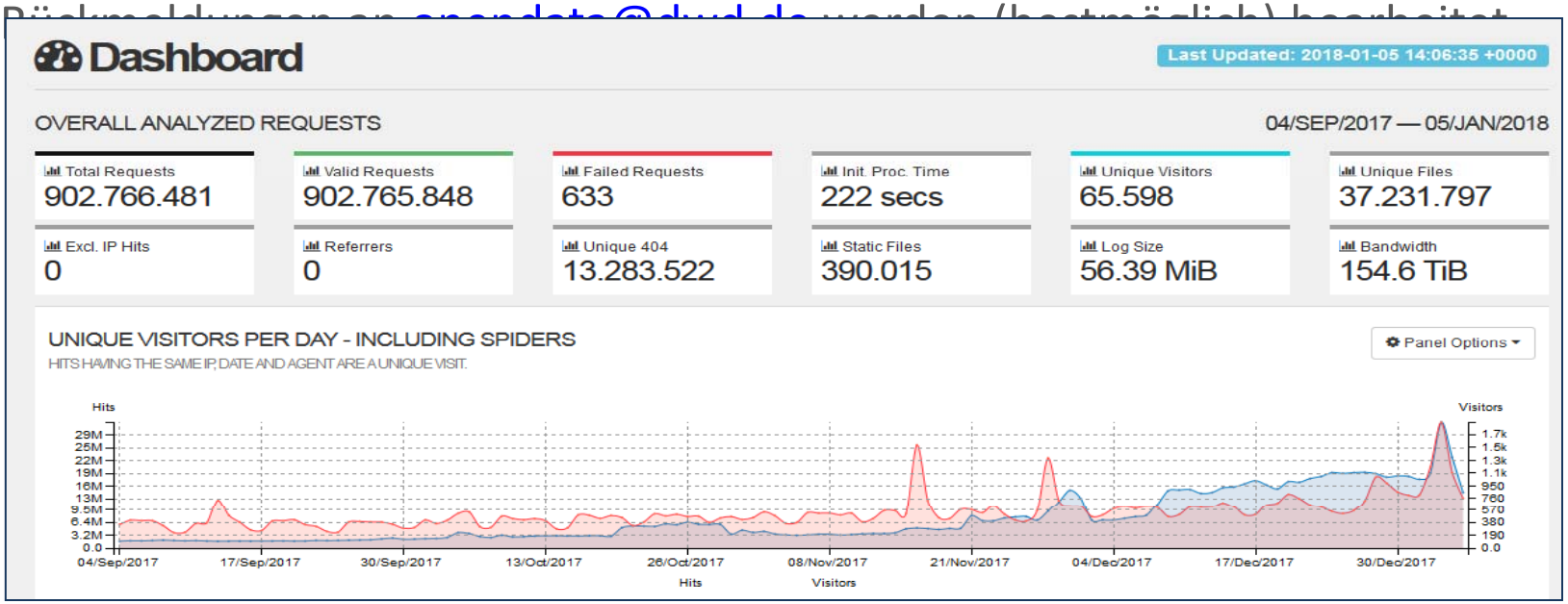
- Aktuelles DWD-Gesetz lässt Interpretationsspielraum bzgl. was wir wie an wen zu welchen Bedingungen abgeben dürfen!
- Eine mögliche Interpretation:
  - Nur Aufg. Nr.3 (Warnungen) und Nr.7 (Radioaktivität) kostenfrei an Allgemeinheit
  - „Atm. Rohdaten“ kostenfrei, aber keine abgeleiteten Daten (GPT, SWS-Vhs.)
- Eine andere mögliche Interpretation:
  - **Alle (standardisiert erstellten) Geodaten und Geodatendienste des DWD stehen entgeltfrei zur Verfügung**
    - Beobachtungen, (Modell-)Vhs., Berichte, Karten, alles mit Geobezug…

- Herausforderung:
  - Geordneter Umzug eines über Jahrzehnte



Aktueller Status von Open Data

- Erste Ausbaustufe ist umgesetzt: https://opendata.dwd.de/
  - Leistungssteckbrief und Dokumentationen sind erstellt
  - (GDS-)Nutzer informiert, Abschaltung ftp://gds*12345*@ftp-outgoing2.dwd.de/ am 17.01.2018
  - RSS-Feed für Open Data Nutzer eingerichtet
- Rückmeldungen an opendata@dwd.de werden (bestmöglich) bearbeitet



opendata.dwd.de *vs.* data.dwd.de

https://opendata.dwd.de

../climate/

../climate_environment/

../test/

../weather/

opendata.dwd.de *vs.* data.dwd.de

../climate/

../climate_environment/

../test/

../weather/

- ../alerts/
- ../charts/
- ../cosmo/
- ……
- ../webcam/

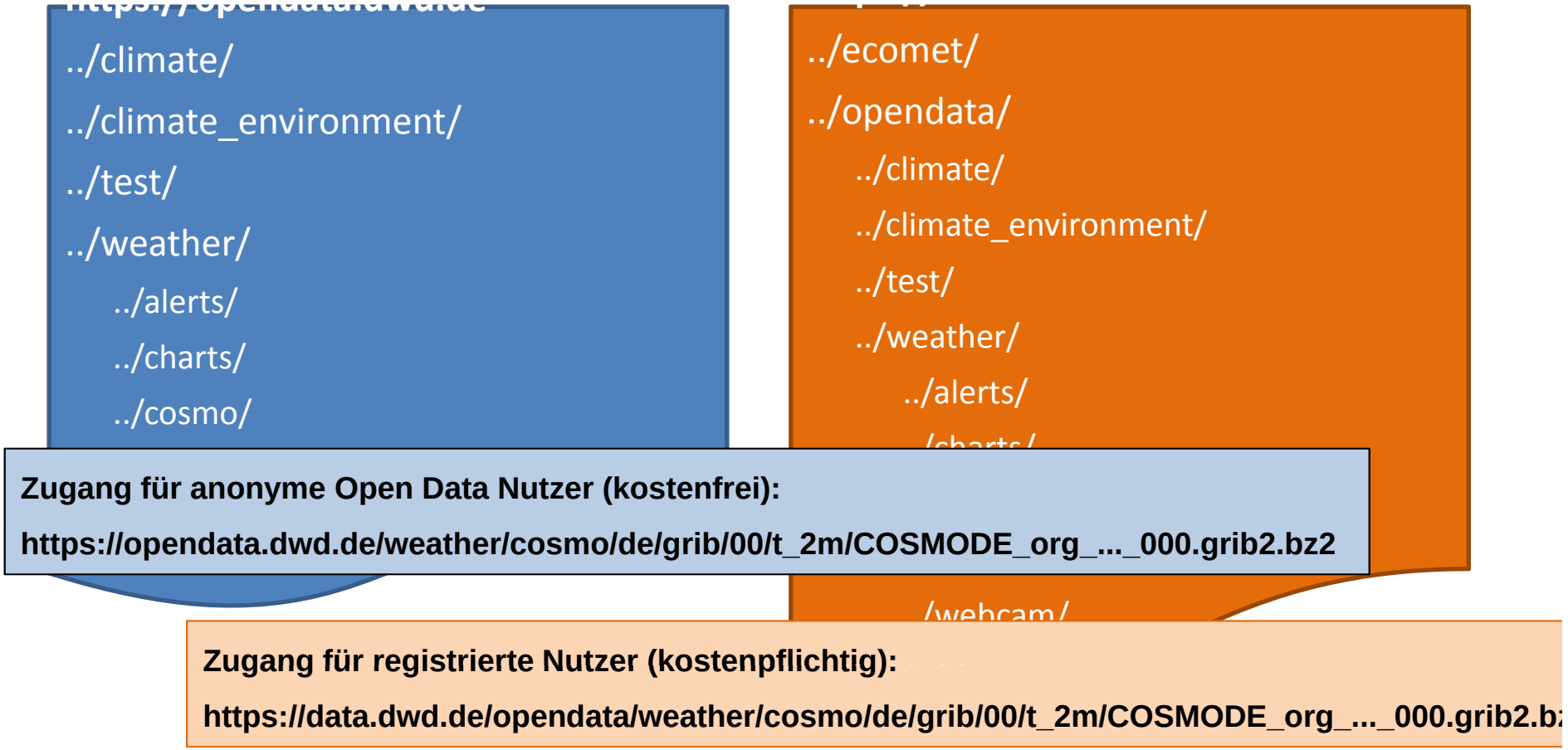
https://data.dwd.de

../ecomet/

../opendata/

../radar_pp/

opendata.dwd.de *vs.* data.dwd.de



Offene Fragen

- **Fachliche und technische Fragestellungen**
  - Zielgruppe(n) der Modell- und Verfahrensentwicklungen?
  - Welche Daten, Produkte, Zwischenprodukte fallen unter Open Data?
    - Was sind Geodaten der “letzten Prozessierungsstufe“?
    - Können/wollen wir Daten zurückhalten? Prä-operationell, intern…
  - Zukünftige Datenmengen auf Open Data?
    - EPS-Daten, model level, Ausgabe auf Originalgitter

Perspektiven

- **Aufbau eines Geoportals als zentrale Schnittstelle zu Kunden und Nutzern von DWD-Leistungen**
  - Ermöglicht die Suche nach und einen Zugriff auf digitale geographische Informationen (Geodaten) und auf geographische Dienste (Darstellung, Editierung, Analyse)
  - Anbieter von geographischen Informationen wie Verwaltungen oder Unternehmen setzen Geoportale ein, um ihre Geodaten sowie Metadaten für potenzielle Nutzer zugänglich und nutzbar zu machen.

➔ **Definition von und Konzentration auf zwei unterschiedliche Zielgruppen**

  - (Groß-)kunden mit speziellen Verträgen und individueller Betreuung (Bund, Länder, Katschutzbehörden, BBK, DFS, Flughäfen, BAB-Gesellschaft, DB, ÜNBs,…)
  - Nicht-registrierte, anonyme Nutzer

➔ **Aufbau der entsprechend notwendigen neuen Strukturen**

Kontakt in WV14

opendata@dwd.de

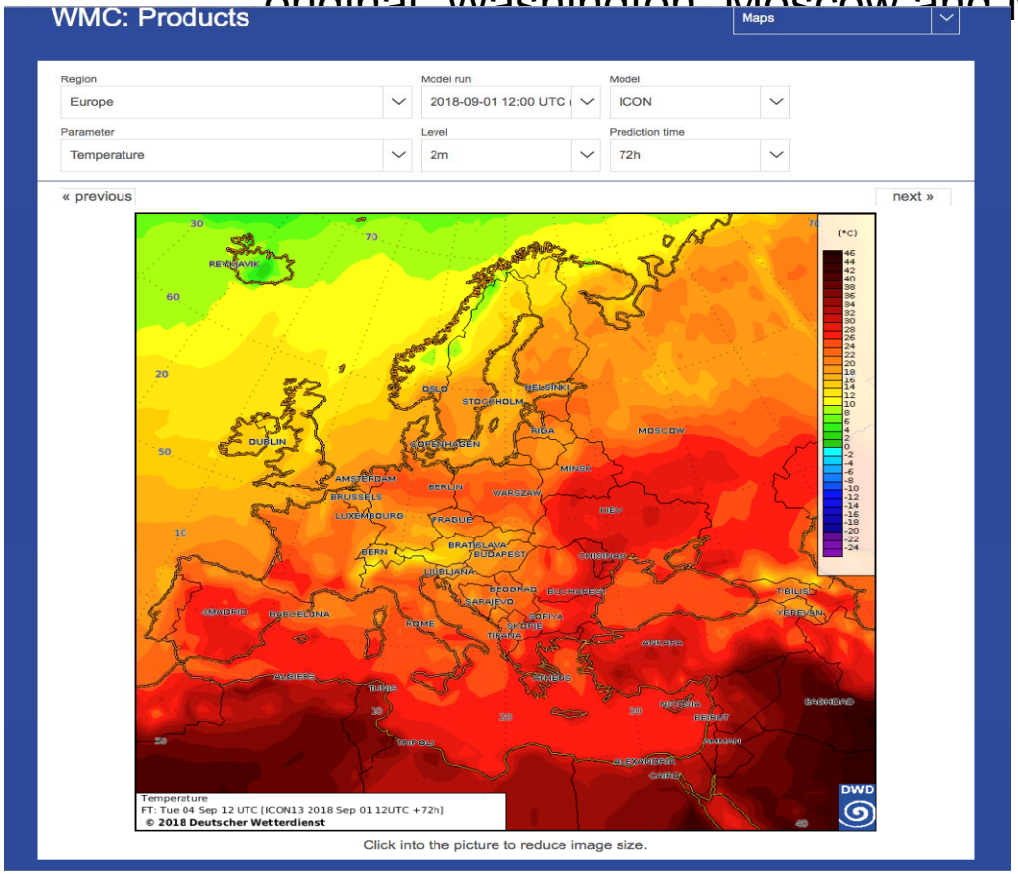
Eduard.Rosert@dwd.de

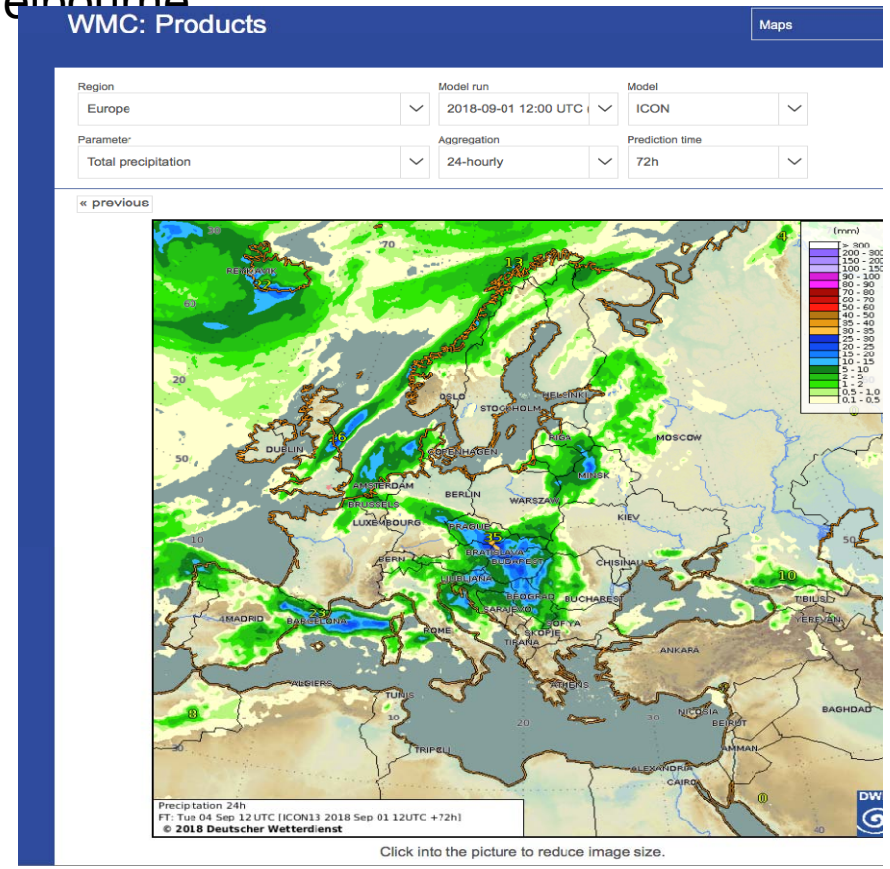
World Meteorological Center

World Meteorological Center

added: ECMWF, Tokyo, Beijing, Exeter and Montreal

original: Washington, Moscow and Melbourne





World Meteorological Center

added: ECMWF, Tokyo, Beijing, Exeter and Montreal

original: Washington, Moscow and Melbourne

World Meteorological Center

added: ECMWF, Tokyo, Beijing, Exeter and Montreal
original: Washington, Moscow and Melbourne

Index of /weather/nwp/icon-eu/grib/00/

../		
alb_rad/	01-Sep-2018 04:19	-
albfl_s/	01-Sep-2018 04:19	-
ascb_s/	01-Sep-2018 04:19	-
aswdifd_s/	01-Sep-2018 04:19	-
aswdifu_s/	01-Sep-2018 04:19	-
aswdir_s/	01-Sep-2018 04:19	-
cape_con/	01-Sep-2018 04:19	-
cape_ml/	01-Sep-2018 04:19	-
clc/	01-Sep-2018 04:19	-
clch/	01-Sep-2018 04:19	-
clcl/	01-Sep-2018 04:19	-
clcm/	01-Sep-2018 04:19	-
clct/	01-Sep-2018 04:19	-
clct_mod/	01-Sep-2018 04:19	-
cldepth/	01-Sep-2018 04:19	-
fi/	01-Sep-2018 04:19	-
fr_lake/	01-Sep-2018 02:43	-
fr_land/	01-Sep-2018 02:43	-
h_snow/	01-Sep-2018 04:19	-
hbas_con/	01-Sep-2018 04:19	-
hhl/	01-Sep-2018 02:43	-
haurf/	01-Sep-2018 02:43	-
htop_con/	01-Sep-2018 04:19	-
hzerocl/	01-Sep-2018 04:19	-
mh/	01-Sep-2018 04:36	-
omega/	01-Sep-2018 04:19	-
p/	01-Sep-2018 04:49	-
plcov/	01-Sep-2018 02:43	-
pmsl/	01-Sep-2018 04:19	-
ps/	01-Sep-2018 04:19	-
qv/	01-Sep-2018 04:49	-
qv_2m/	01-Sep-2018 04:19	-
qv_s/	01-Sep-2018 04:19	-
rain_con/	01-Sep-2018 04:19	-
rain_gsp/	01-Sep-2018 04:19	-
relhum/	01-Sep-2018 04:19	-
relhum_2m/	01-Sep-2018 04:19	-
rho_snow/	01-Sep-2018 04:19	-
rlat/	01-Sep-2018 02:43	-
rlon/	01-Sep-2018 02:43	-
rootdp/	01-Sep-2018 02:43	-
runoff_g/	01-Sep-2018 04:19	-
runoff_s/	01-Sep-2018 04:19	-
snow_con/	01-Sep-2018 04:19	-
snow_gsp/	01-Sep-2018 04:19	-
snowlmt/	01-Sep-2018 04:19	-
soiltyp/	01-Sep-2018 02:43	-
t/	01-Sep-2018 04:49	-
t_2m/	01-Sep-2018 04:19	-
t_g/	01-Sep-2018 04:19	-
t_snow/	01-Sep-2018 04:19	-
t_so/	01-Sep-2018 04:19	-
tch/	01-Sep-2018 04:19	-
tcm/	01-Sep-2018 04:19	-
td_2m/	01-Sep-2018 04:19	-
tke/	01-Sep-2018 04:49	-
tmax_2m/	01-Sep-2018 04:19	-
tmin_2m/	01-Sep-2018 04:19	-
tot_prec/	01-Sep-2018 04:19	-
u/	01-Sep-2018 04:49	-
u_10m/	01-Sep-2018 04:19	-
v/	01-Sep-2018 04:49	-
v_10m/	01-Sep-2018 04:19	-
vmax_10m/	01-Sep-2018 04:19	-
w/	01-Sep-2018 04:49	-
w_snow/	01-Sep-2018 04:19	-

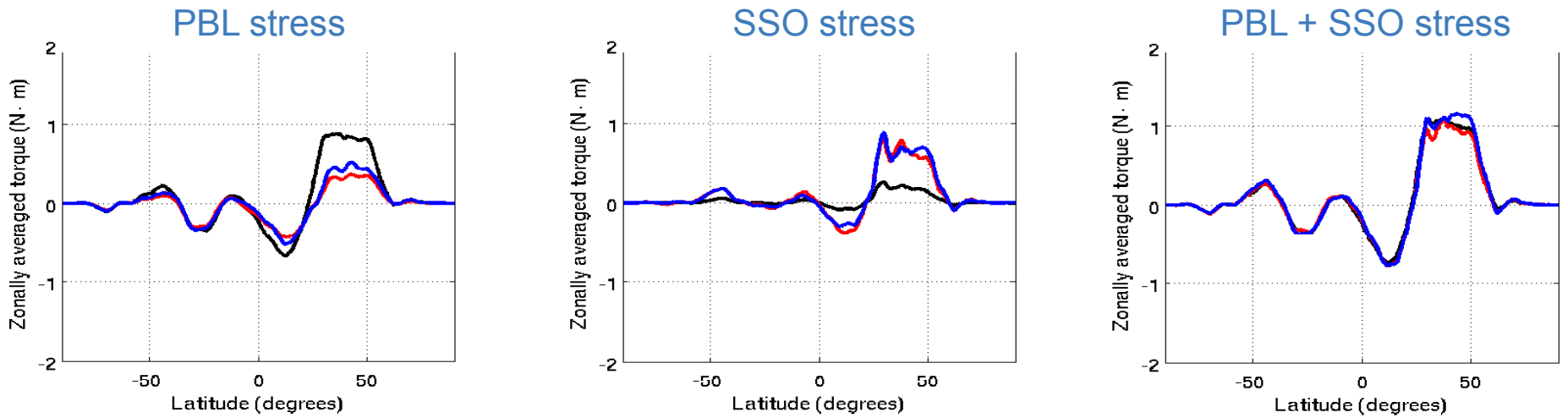
Extra Slides

Example

Physics in ICON

Process	Scheme	Origin	Authors
Radiation	RRTM	ECHAM6/IFS	Mlawer et al. (1997) Barker et al. (2002)
	δ two-stream	GME/COSMO	Ritter and Geleyn (1992)
Non-orographic gravity wave drag	wave dissipation at critical level	IFS	Scinocca (2003) Orr, Bechtold et al. (2010)
Sub-grid scale orographic drag	blocking, GWD	IFS	Lott and Miller (1997)
Cloud cover	diagnostic PDF	ICON	Köhler et al. (new)
	sub-grid diagnostic	GME/COSMO	Doms et al. (2011)
Microphysics	prognostic: water vapor, cloud water,cloud ice, rain and snow	GME/COSMO	Doms et al. (2011) Seifert (2010)
	two-moment incl. graupel and hail	COSMO	Seifert and Beheng (2006)
Convection	mass-flux shallow and deep	IFS	Bechtold et al. (2008)
Turbulent transfer	prognostic TKE	COSMO	Raschendorfer (2001)
	prognostic TKE and scalar variances	COSMO	Machulskaya, Mironov (2013)
	EDMF-DUALM	IFS	Neggers, Köhler, Beljaars (2010)
Surface Processes	tiled TERRA + FLAKE + multi-layer snow + sea ice	GME/COSMO	Heise and Schrodin (2002), Helmert, Schulz et al. (2016), Mironov (2008) Machulskaya (2015)

Surface stress in MetOffice, ECMWF and ICON



Jan 2012 24h average over land [Nm 10^{19}]

Turbulent Orographic Form Drag - in ICON

- orography:
  - TanDEM-X at 12m/90m
  - ASTER at 30m
  - data transfer to DKRZ, Hamburg (1PetaByte)

- processing:
  - filter above 5km: SSO parameters (for each resolution)
  - filter below 5km: TOFD variance (done once)
  - algorithm development (3 weeks)

- parameterisation:
  - TOFD scheme in ICON

- ICON 312m test: filtered orography (to 5km)
  - flow slowed by 0.6m/s to 1500m
  - turbulent boundary layer ranges to about 1500m
  - resolved vertical motion peaks 0-6km (horiz. scales?)