

Implementation of a Mire parameterization in TERRA - Experiments with COSMO-D2

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Summer 2018

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

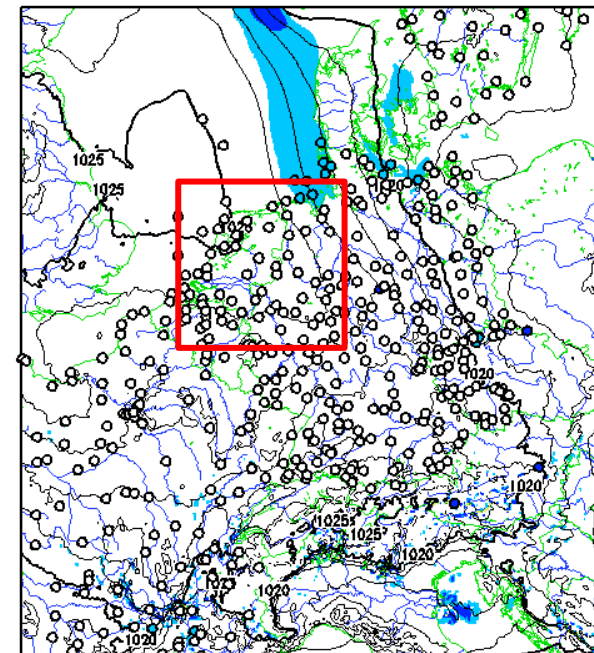


- Very warm
- Very dry
- In principle good conditions for balloon rides...

Guidance from COSMO-D2 too gusty ...
Problem for balloon rides and
forecasters of national service

COSMO_DE 2.2 km (Routine)
initial: 08 JUL 2018 00 UTC
valid: 08 JUL 2018 01 UTC
10m MAX. WIND (> 10.8m/s, MODEL and SYNOP)

FX



(1) MODEL: Mean: 5.41416 Min: 0.0501999 Max: 28.0883
(1) SYNOP: Mean: 4.21 Min: 0.00 Max: 16.00 nobs: 410



View from Skreiabanen towards Lensbygda at Toten - Wikipedia

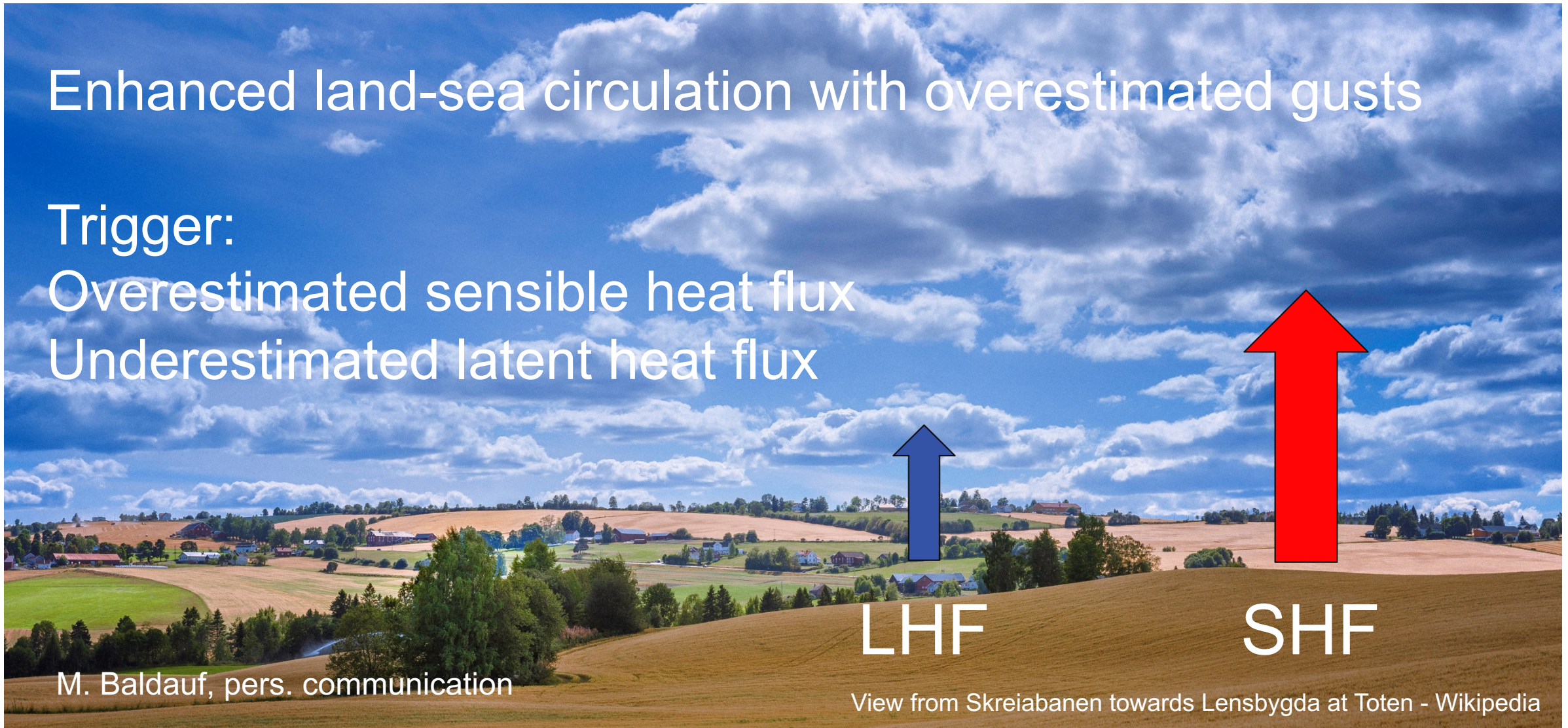


Enhanced land-sea circulation with overestimated gusts

Trigger:

Overestimated sensible heat flux

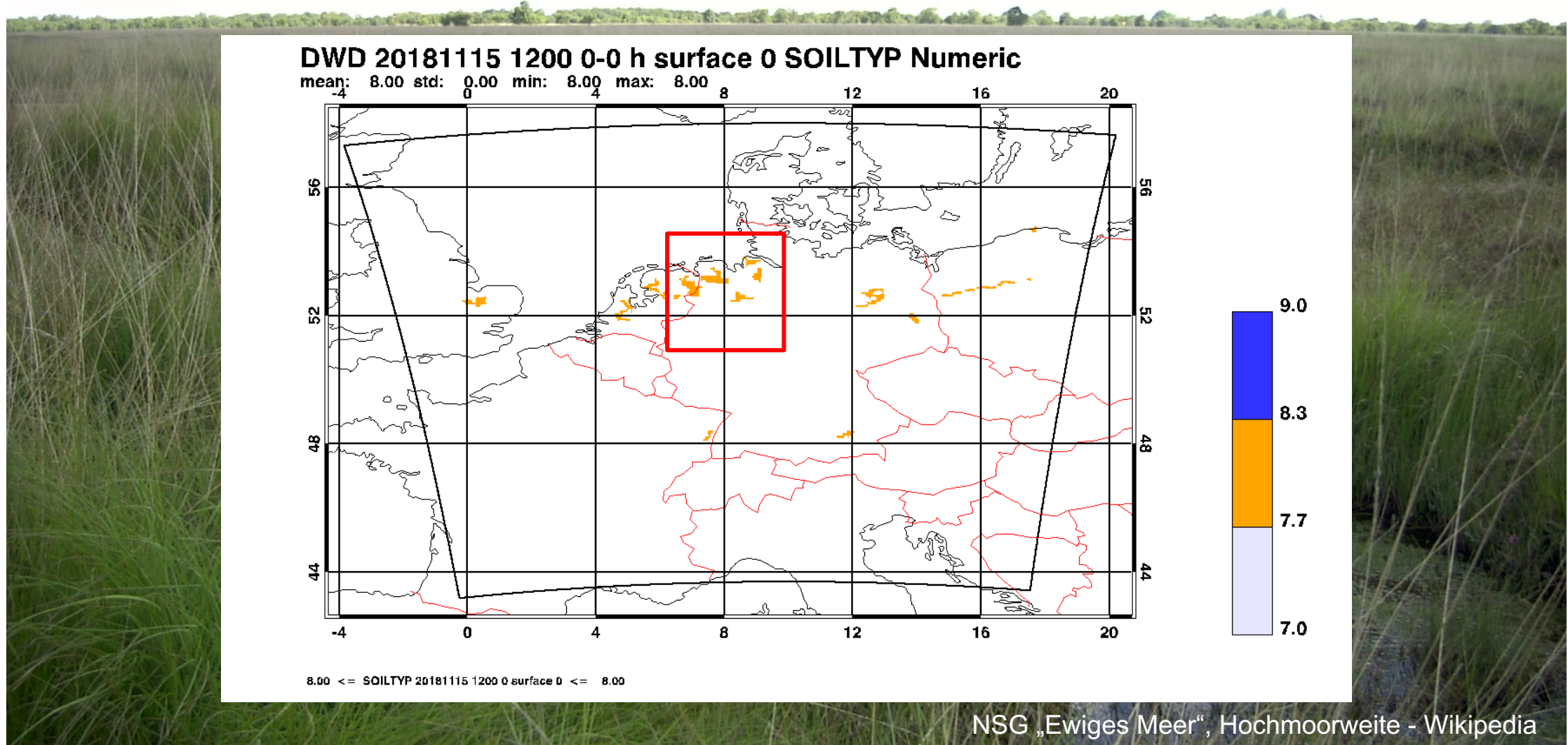
Underestimated latent heat flux



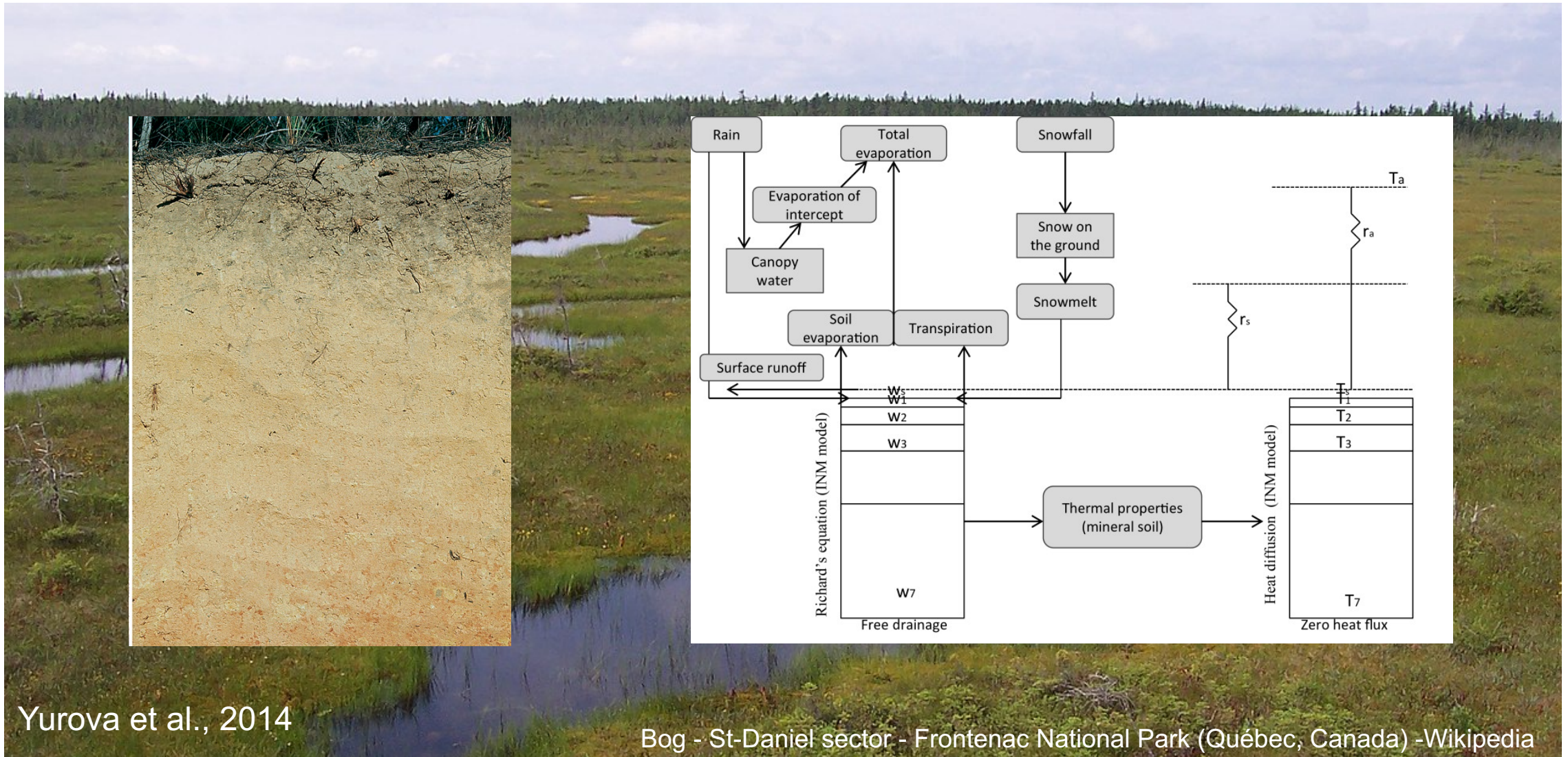
M. Baldauf, pers. communication

View from Skreiabanen towards Lensbygda at Toten - Wikipedia

Peatlands in COSMO-D2



Peatlands in TERRA



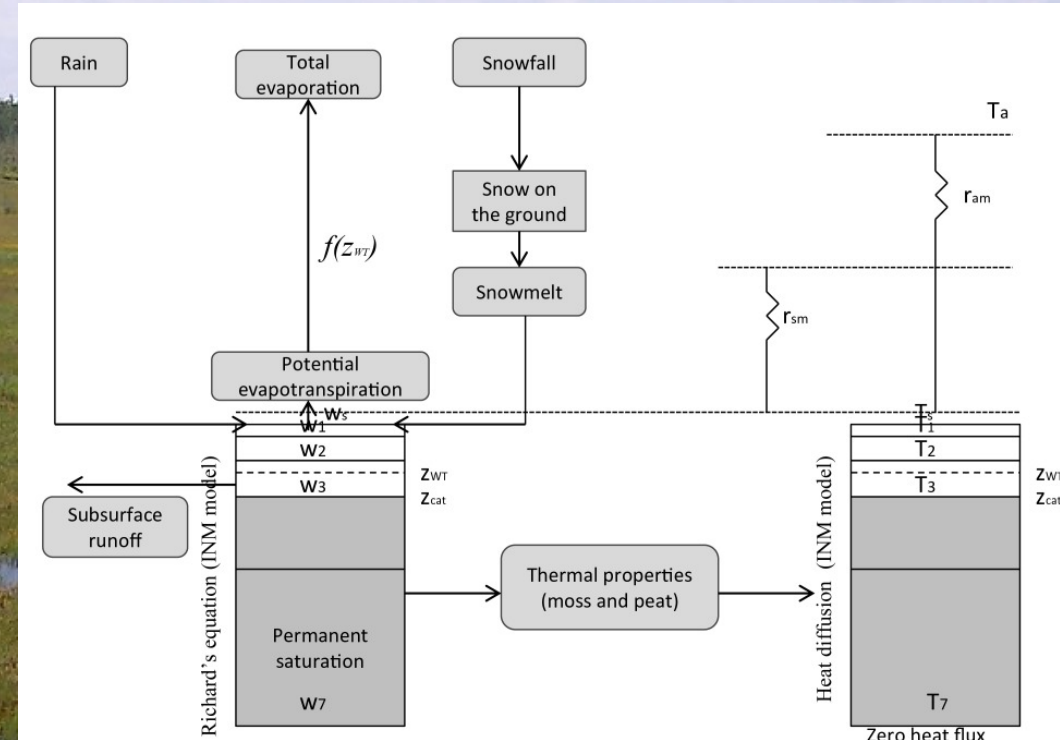
Peatlands in TERRA



Réserve naturelle de la tourbière, France - Wikipedia

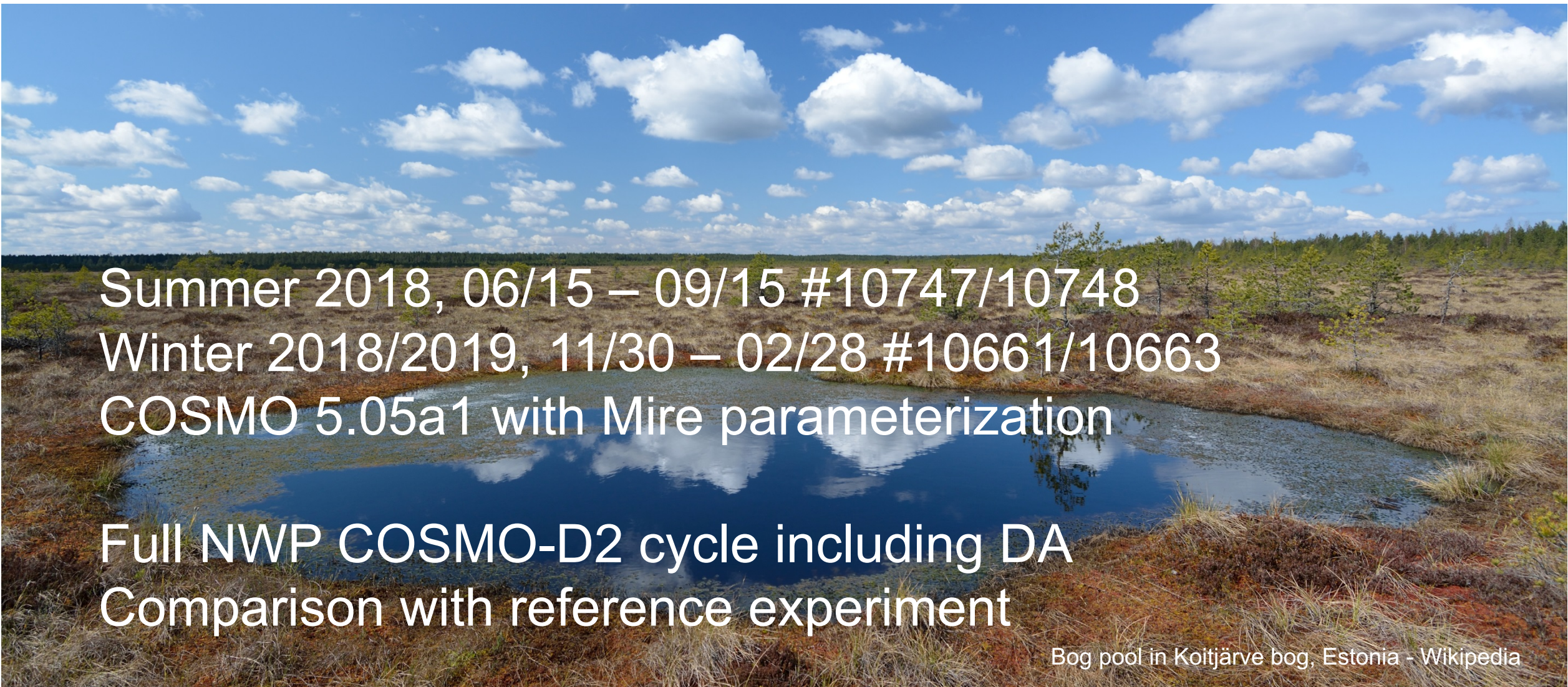
itype_mire = 1
itype_heatcond = 3

Yurova et al., 2014



- Modification in TERRA: Evaporation
 - Soil heat conductivity
 - Soil water budget

Bog - St-Daniel sector - Frontenac National Park (Québec, Canada) -Wikipedia



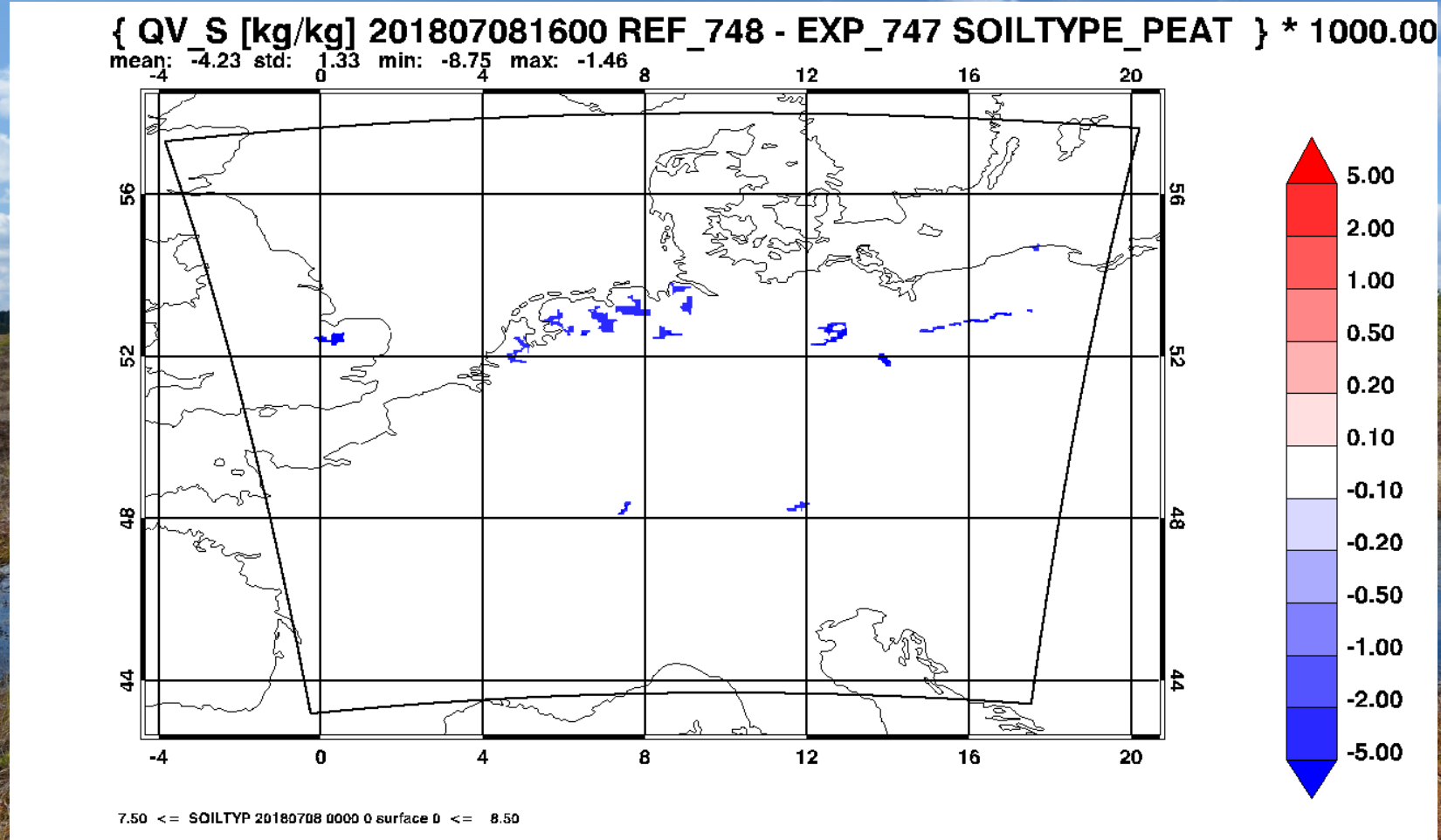
Summer 2018, 06/15 – 09/15 #10747/10748
Winter 2018/2019, 11/30 – 02/28 #10661/10663
COSMO 5.05a1 with Mire parameterization

Full NWP COSMO-D2 cycle including DA
Comparison with reference experiment

Bog pool in Koltjärve bog, Estonia - Wikipedia

Surface moisture REF-EXP

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



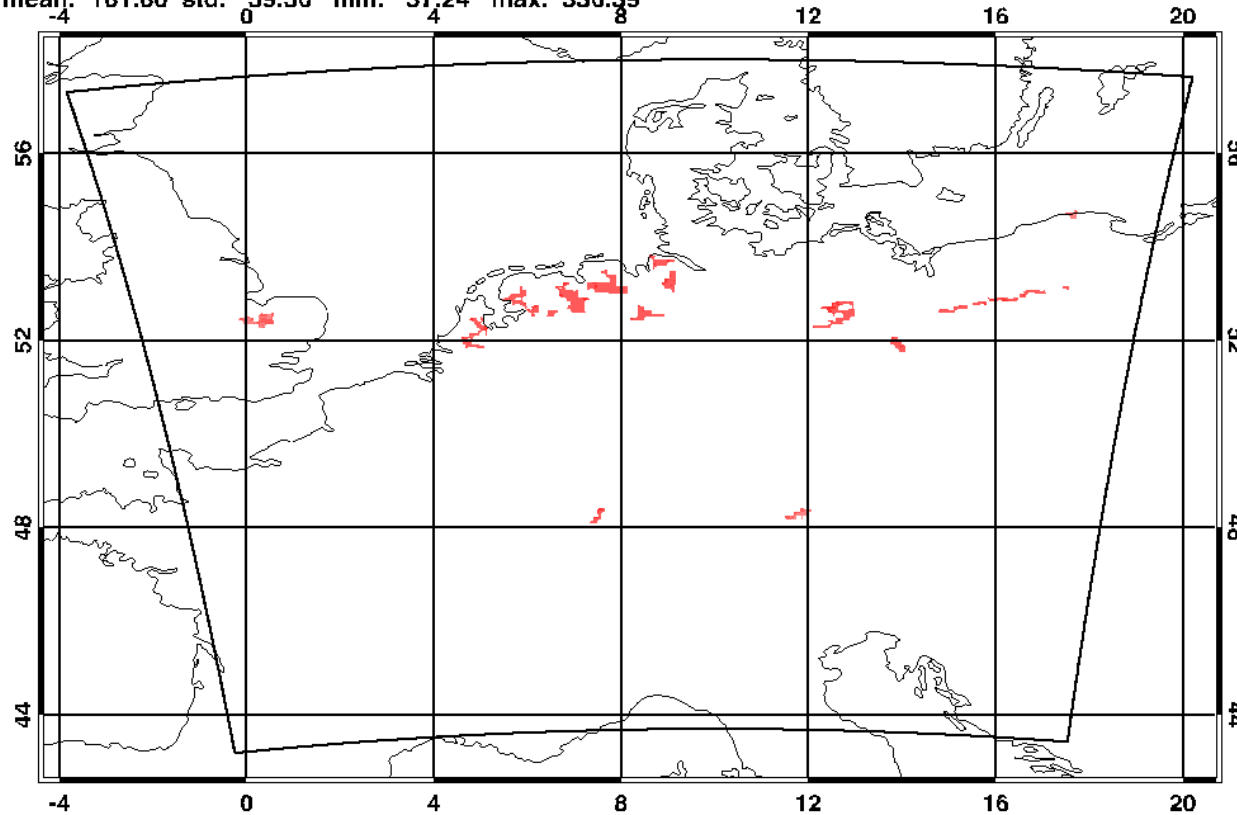
Averaged latent heat flux REF-EXP

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



ALHFL_S [W m⁻²] 201807081600 REF_748 - EXP_747 SOILTYPE_PEAT

mean: 161.60 std: 39.30 min: 57.24 max: 350.59



7.50 <= SOILTYP 20180708 0000 0 surface 0 <= 8.50



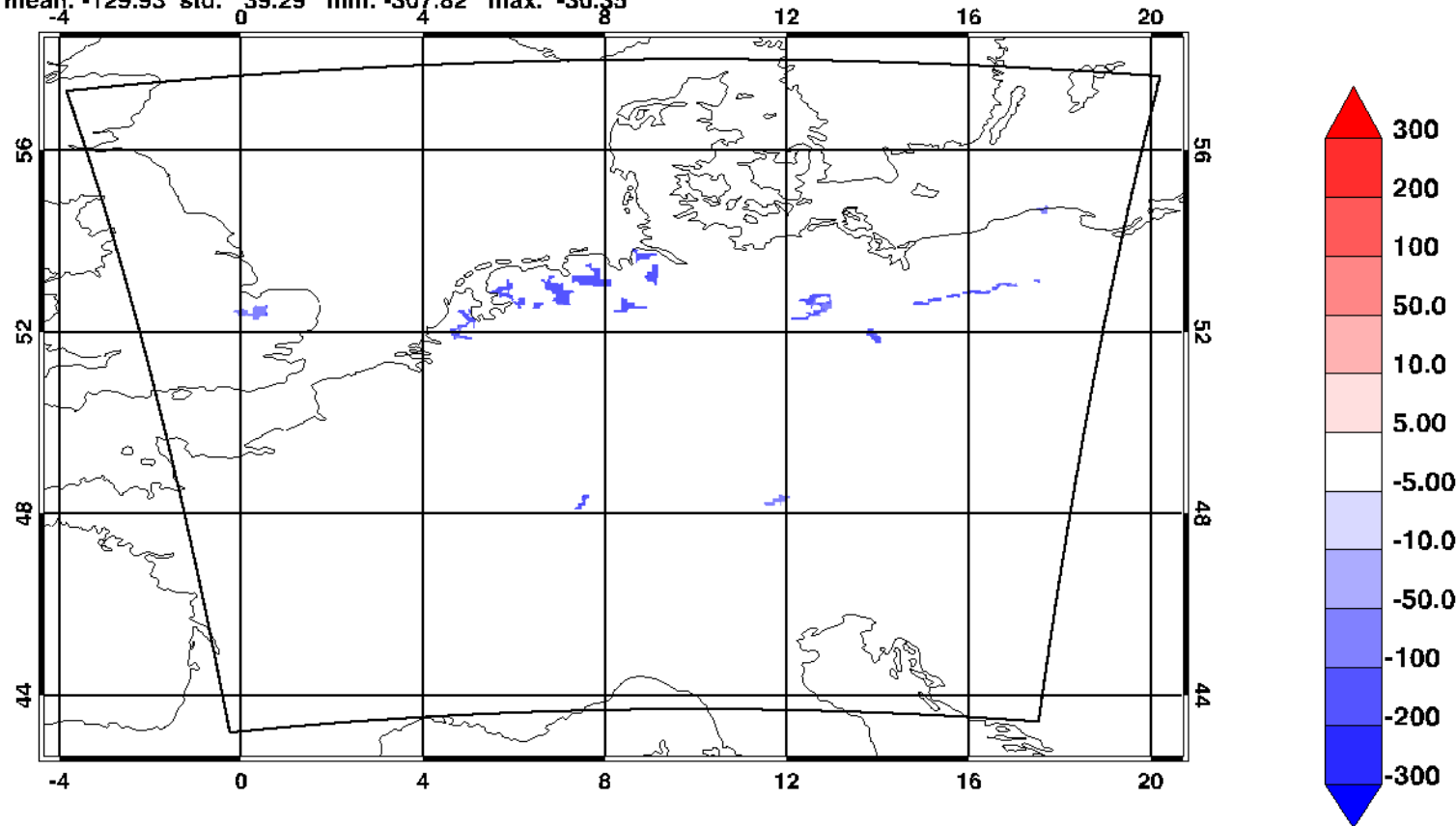
Bog pool in Koltjärve bog, Estonia - Wikipedia



Averaged sensible heat flux REF-EXP

ASHFL_S [W m⁻²] 201807081600 REF_748 - EXP_747 SOILTYPE_PEAT

mean: -129.93 std: 39.29 min: -307.82 max: -30.35



7.50 <= SOILTYP 20180708 0000 0 surface 0 <= 8.50

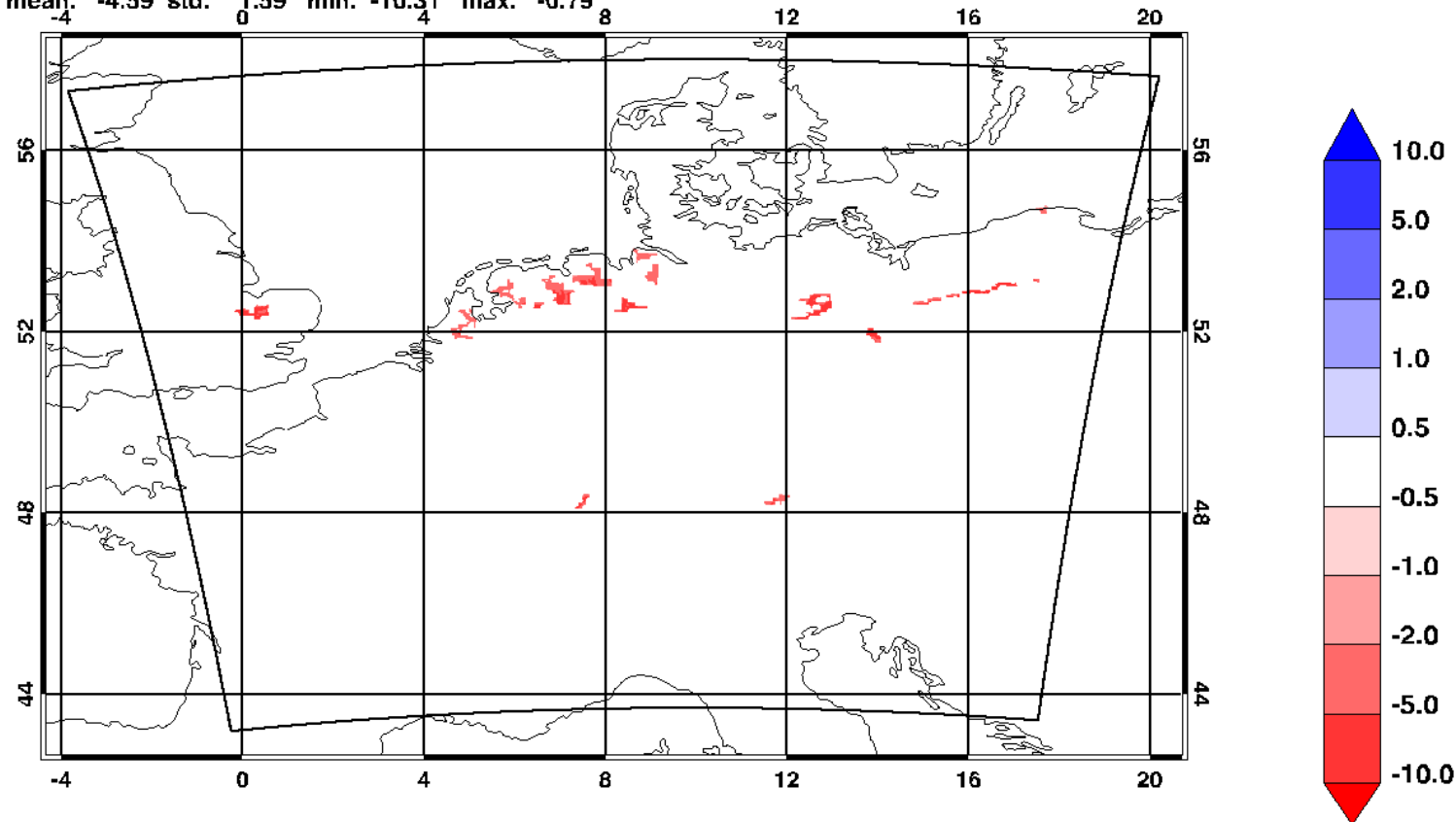
with Mire
scheme

Bog pool in Koltjärve bog, Estonia - Wikipedia

2m dew point temperature REF-EXP

TD_2M [K] 201807081600 REF_748 - EXP_747 SOILTYPE_PEAT

mean: -4.59 std: 1.59 min: -10.31 max: -0.79



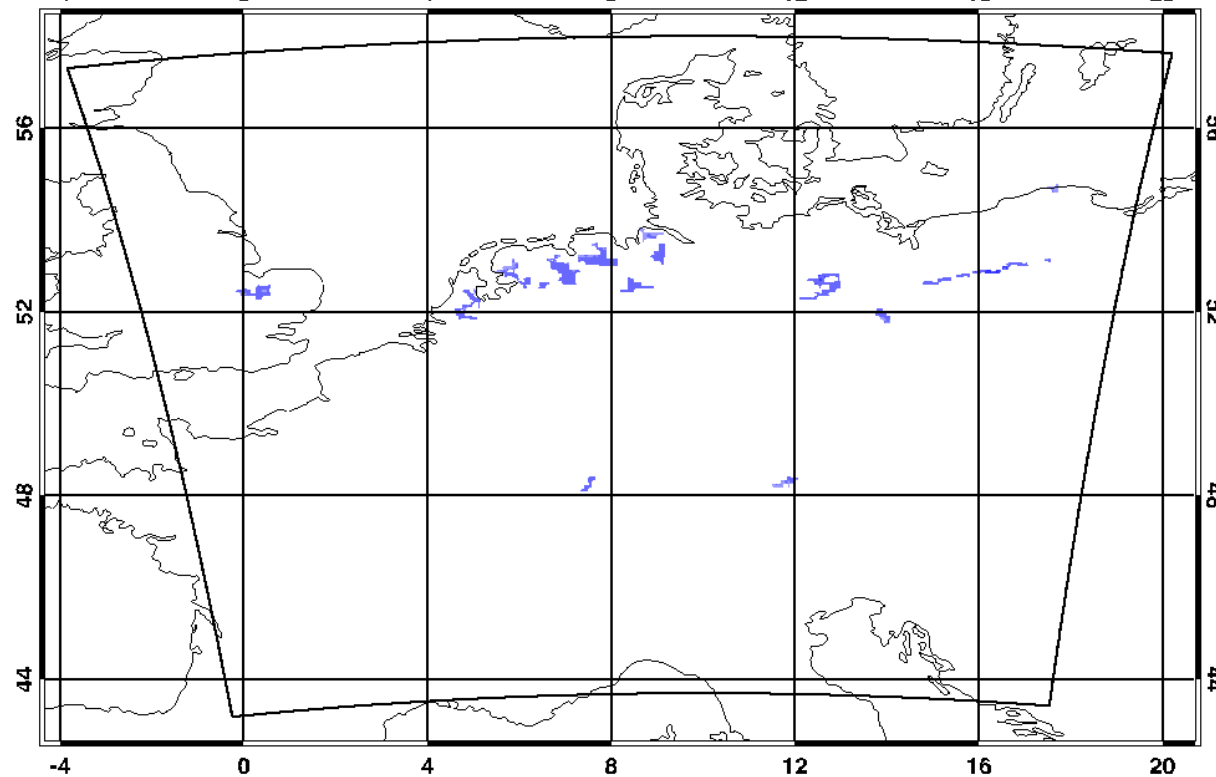
with Mire
scheme

Bog pool in Koltjärve bog, Estonia - Wikipedia

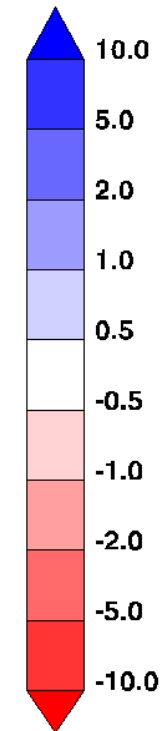
2m temperature REF-EXP

T_2M [K] 201807081600 REF_748 - EXP_747 SOILTYPE_PEAT

mean: 2.87 std: 0.90 min: 0.78 max: 6.41



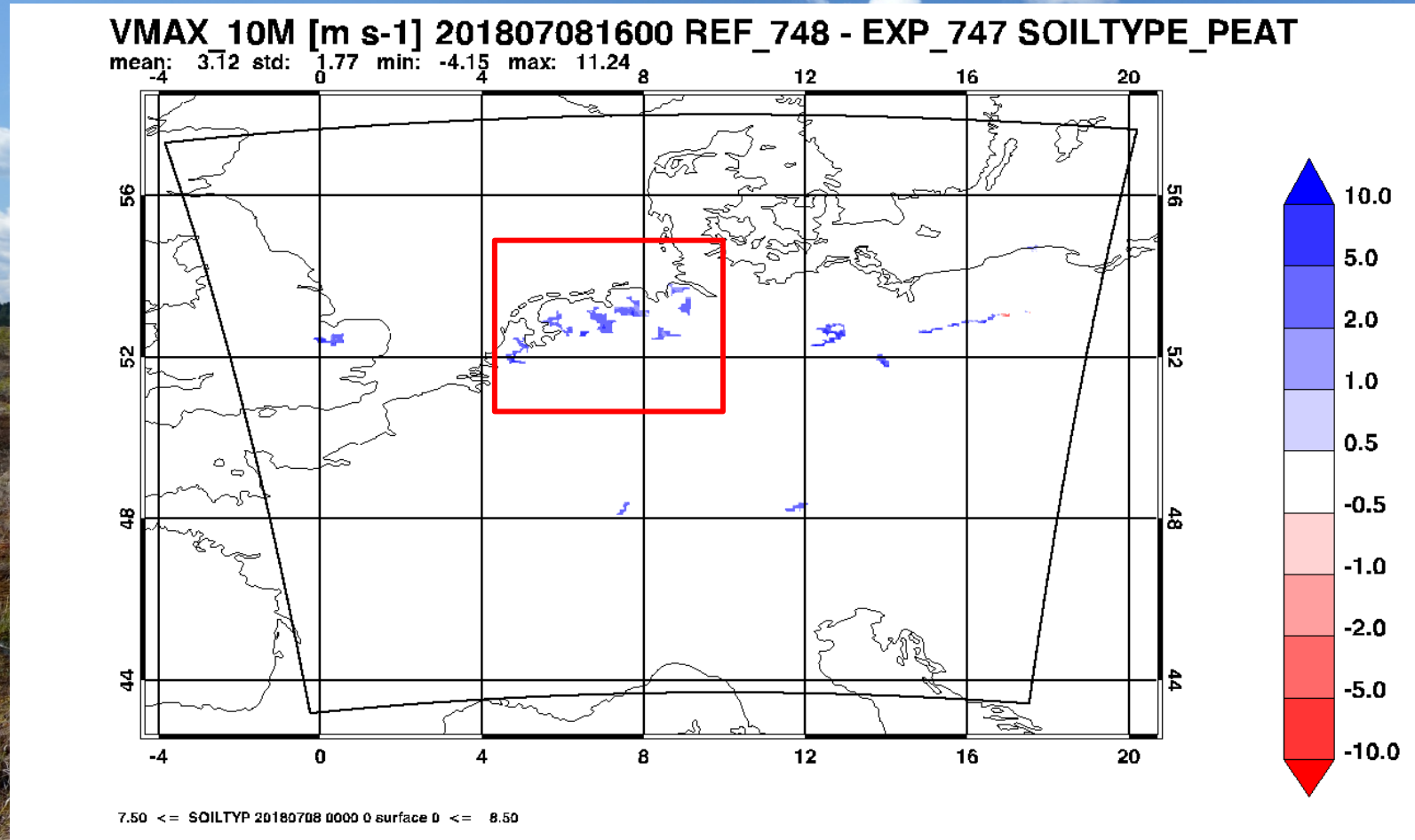
7.50 <= SOILTYP 20180708 0000 0 surface 0 <= 8.50



with Mire
scheme

Bog pool in Koltjärve bog, Estonia - Wikipedia

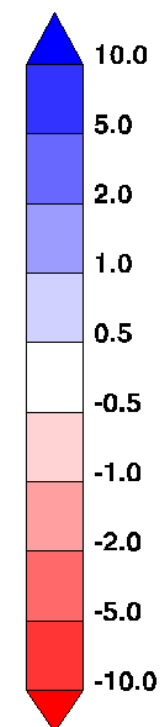
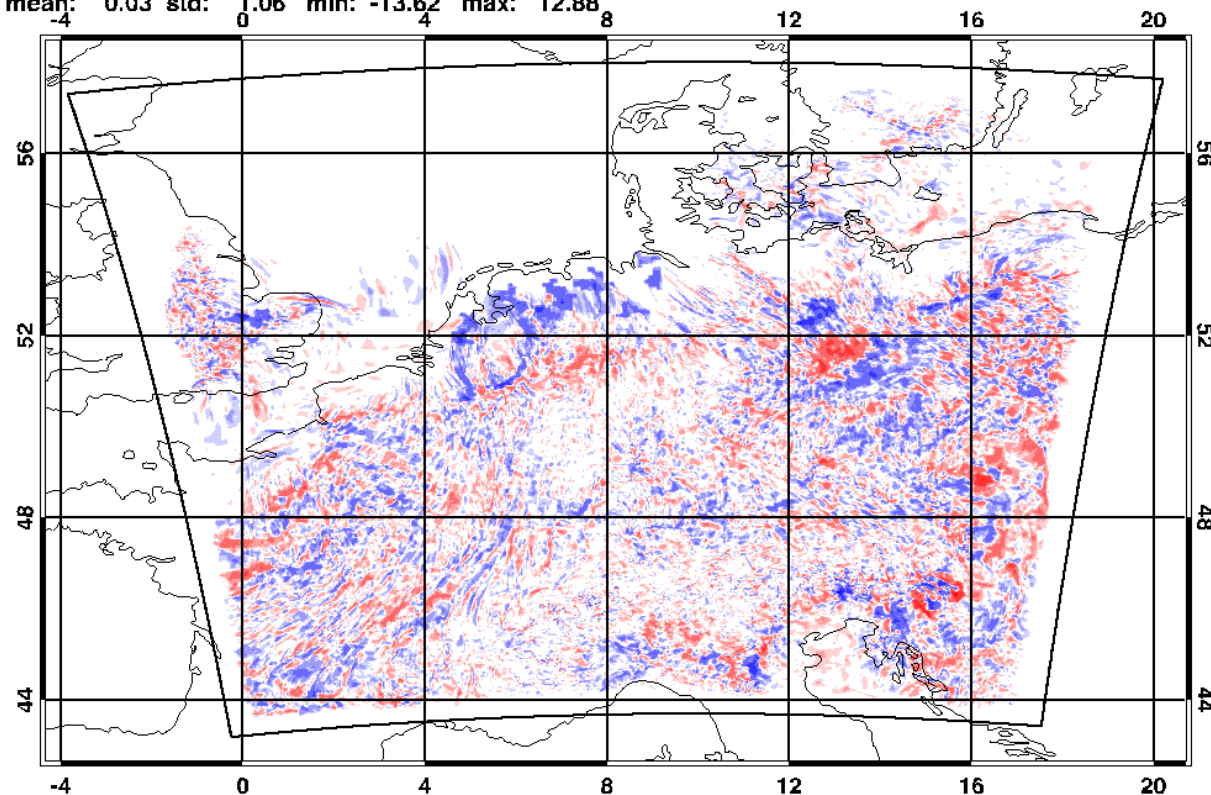
10 m gusts REF-EXP



10 m gusts REF-EXP

VMAX_10M [m s⁻¹] 2018070816 REF_748 - EXP_747

mean: 0.03 std: 1.06 min: -13.62 max: 12.88



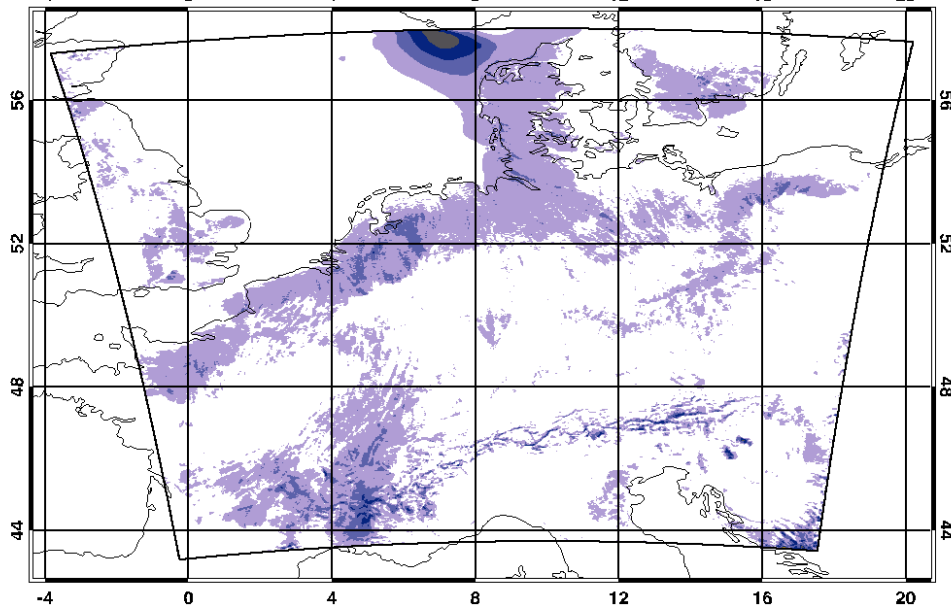
with Mire
scheme

Bog pool in Koltjärve bog, Estonia - Wikipedia

10 m gusts

DWD 20180708 0000 15-16 h heightAboveGround 10 VMAX_10M m s-1

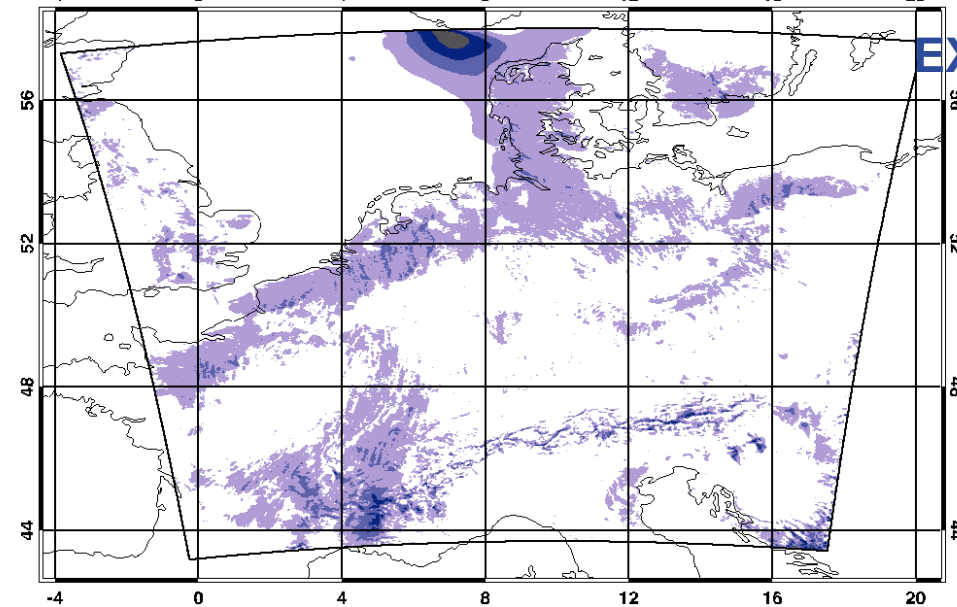
mean: 8.47 std: 3.17 min: 0.25 max: 27.84



REF

DWD 20180708 0000 15-16 h heightAboveGround 10 VMAX_10M m s-1

mean: 8.44 std: 3.15 min: 0.23 max: 27.84



EXP

Bog pool in Koltjärve bog, Estonia - Wikipedia



Verification – COSMO-D2

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



SURFACE VERIFICATION				
DETERMINISTIC	CONTINUOUS	lead-time	time-series	station
	CATEGORICAL	lead-time	time-series	station
EPS	ENS & PROB	lead-time (old)		

UPPER AIR VERIFICATION				
DETERMINISTIC	CONTINUOUS	lead-time	time-series	station
EPS	ENSEMBLE	lead-time	time-series	station

ROUTINE VERIFICATION		
ICON P1	SYNOP	categorical
		hit rates
		continuous
ICON PA	TEMP	continuous
		categorical
		hit rates
ICON-EPS P1	SYNOP	ensemble
		ensemble
		ensemble
ICON vs IFS	SYNOP	categorical
		hit rates
		continuous
ICON-EPS vs IFS-EPS	TEMP	continuous
		ensemble
		ensemble

MONTHLY SERIES		Link
WMO-CBS	Temp Synop Ana	
WMO-EPS	Ana	
WGNE	24h precip	
Spatial	1h precip (user ffundel) *new*	
Score Card	Link *beta*	

SPECIAL VERIFICATION		
Catchments precip.	Link	
Verification since 1968	Link	

UTILITIES	
Fdbk File Table	Fdbk File Plot
Do-it-Yourself Verification	
Documentation Rfdbk	
Documentation FFV	

MONITORING	
Shiny-server	Feedback files PBS jobs Veri jobs
Wind profiler	
AIREP	
Klimadaten (SASSCAL)	

GRIB VIEWER	
regular grid	icosahedral grid (3D)

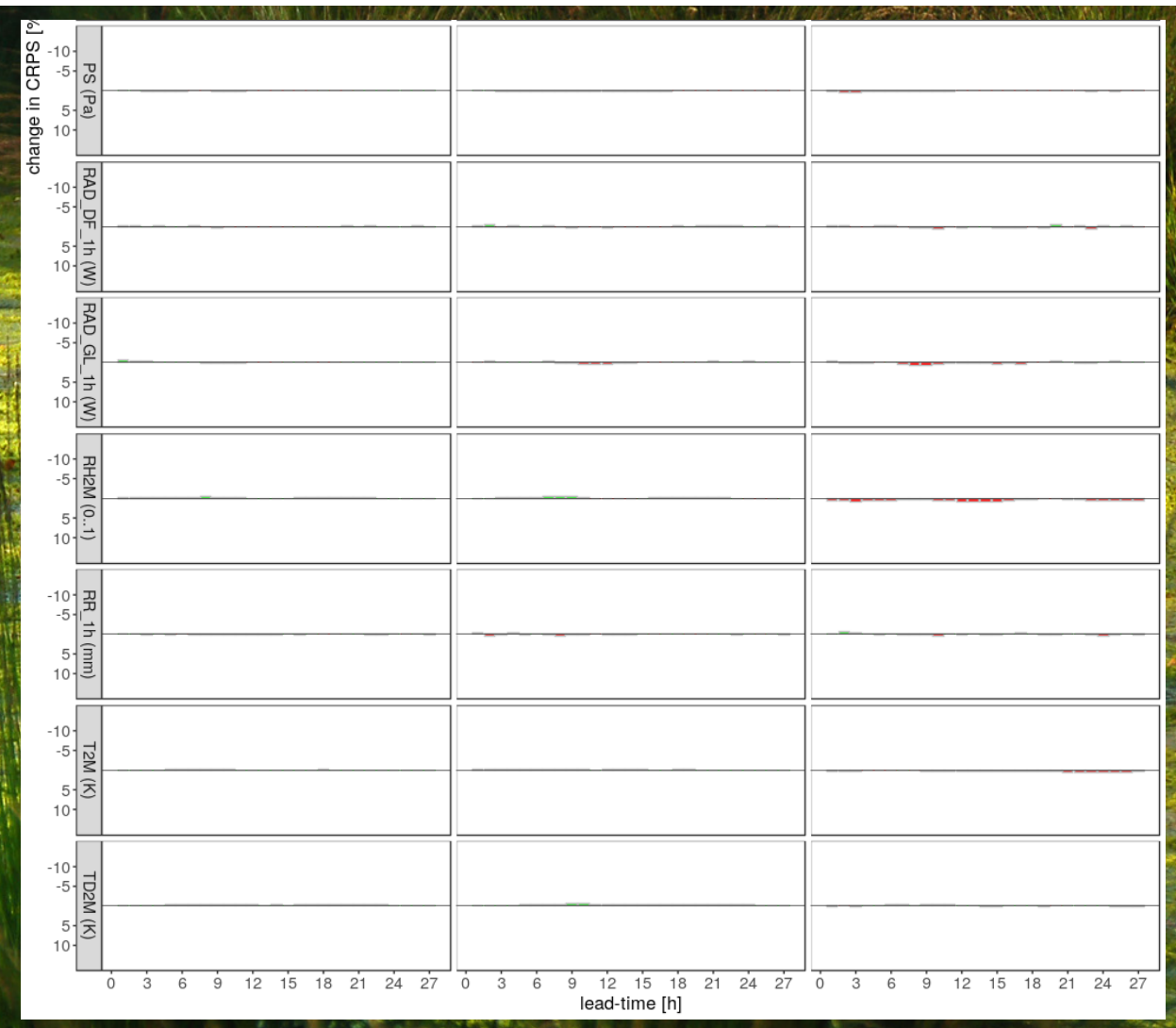
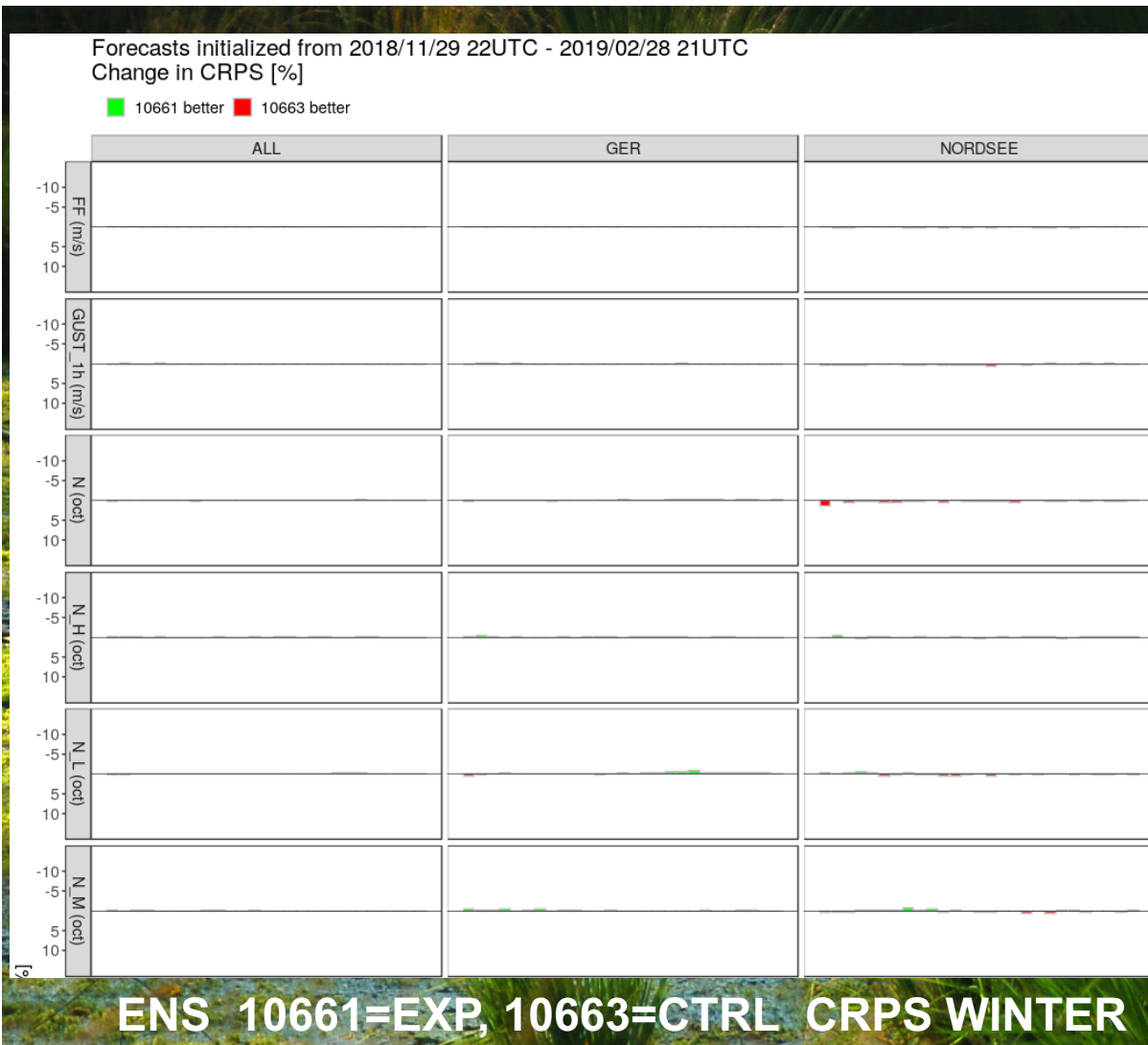
Met.3D	
test	

Lütt-Witt Moor, Henstedt-Ulzburg, Germany - Wikipedia



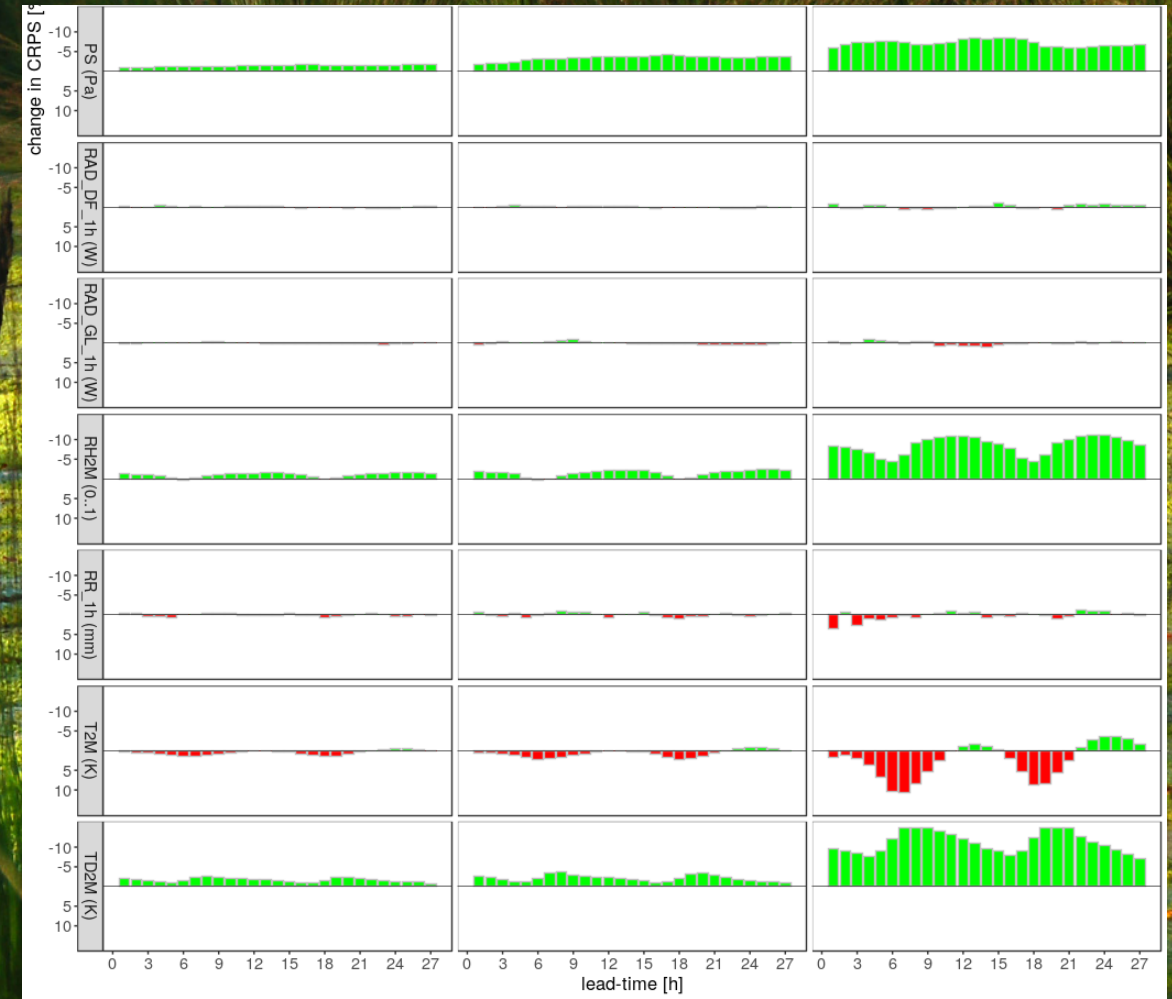
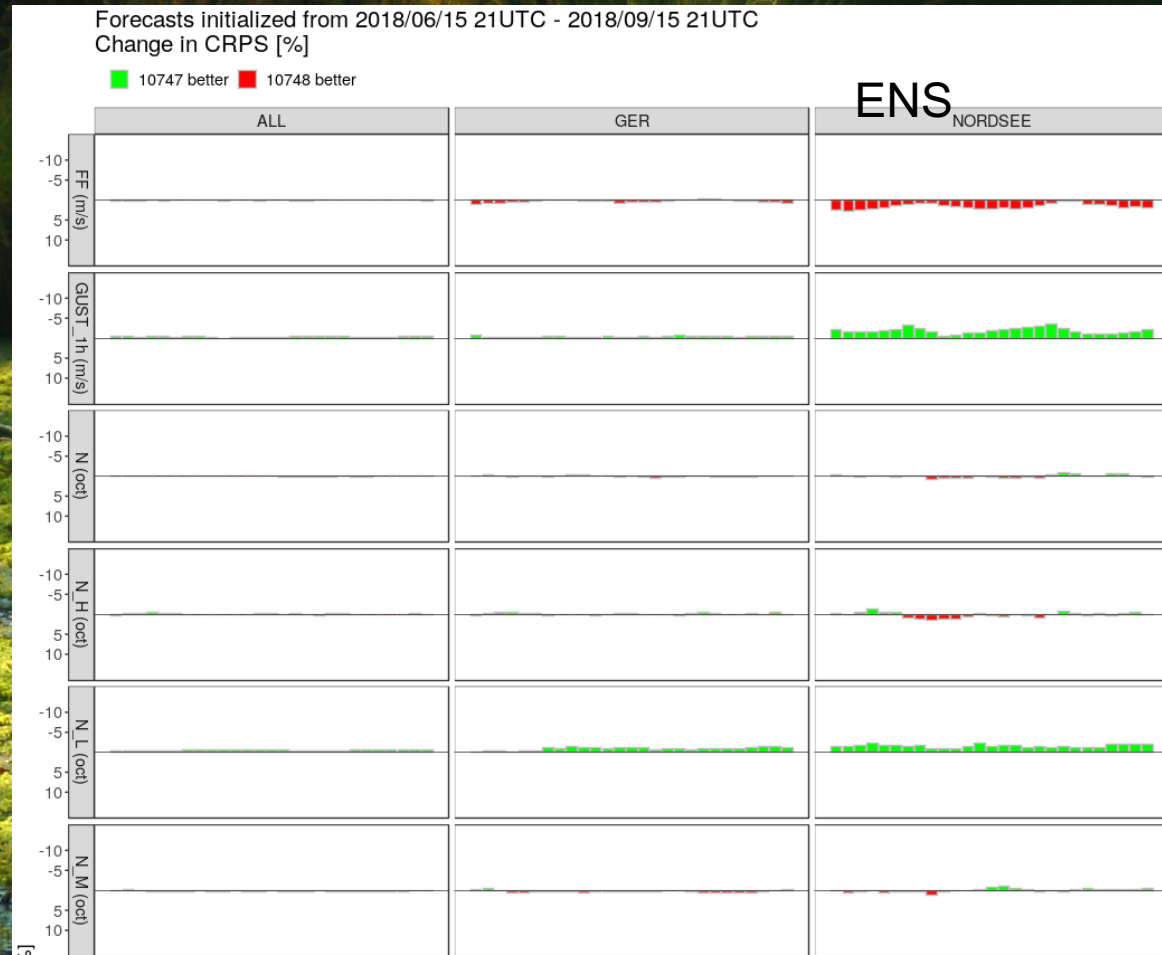
Verification – COSMO-D2

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Verification – COSMO-D2

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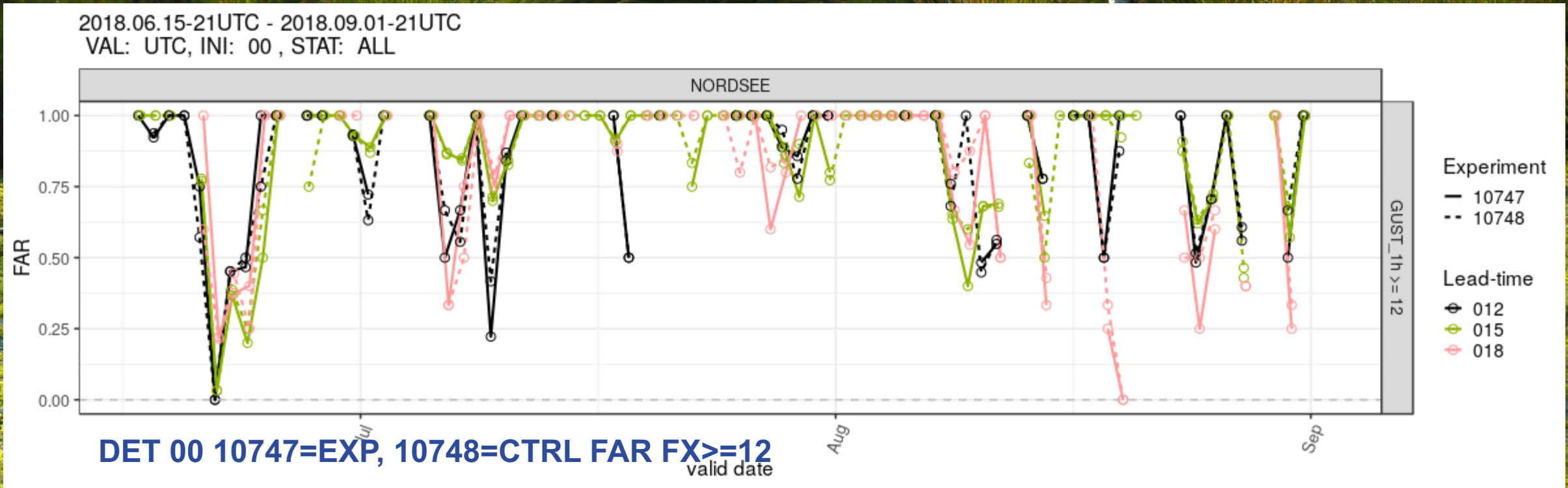


ENS 10747=EXP, 10748=CTRL CRPS SOMMER



Verification – COSMO-D2

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

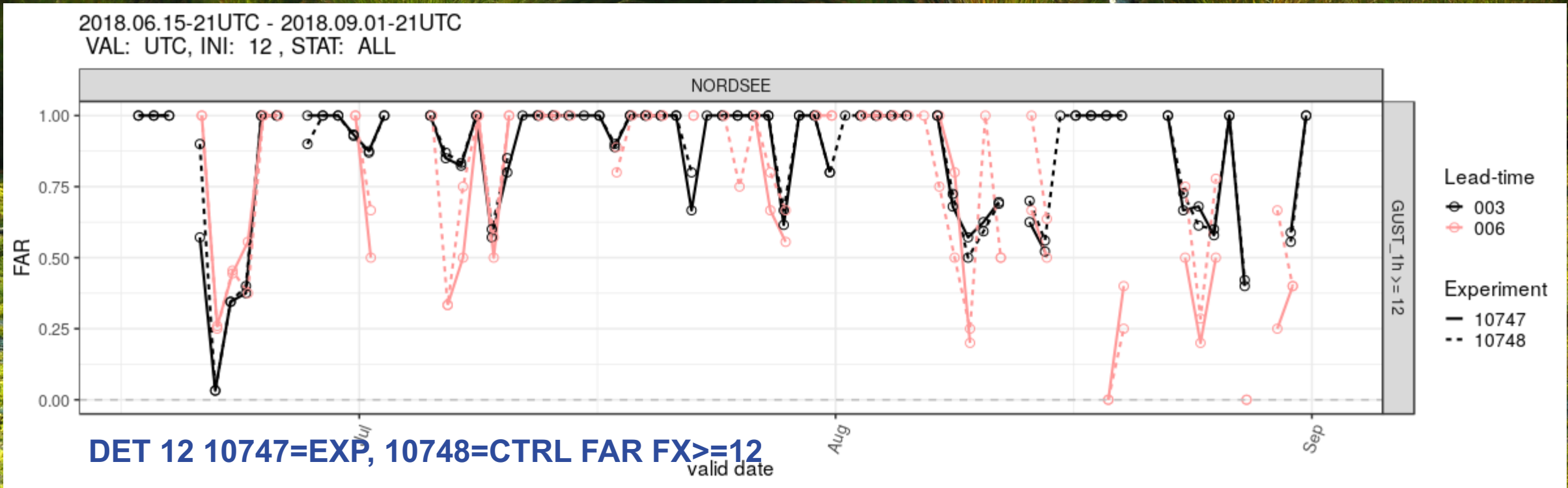


Lütt-Witt Moor, Henstedt-Ulzburg, Germany - Wikipedia



Verification – COSMO-D2

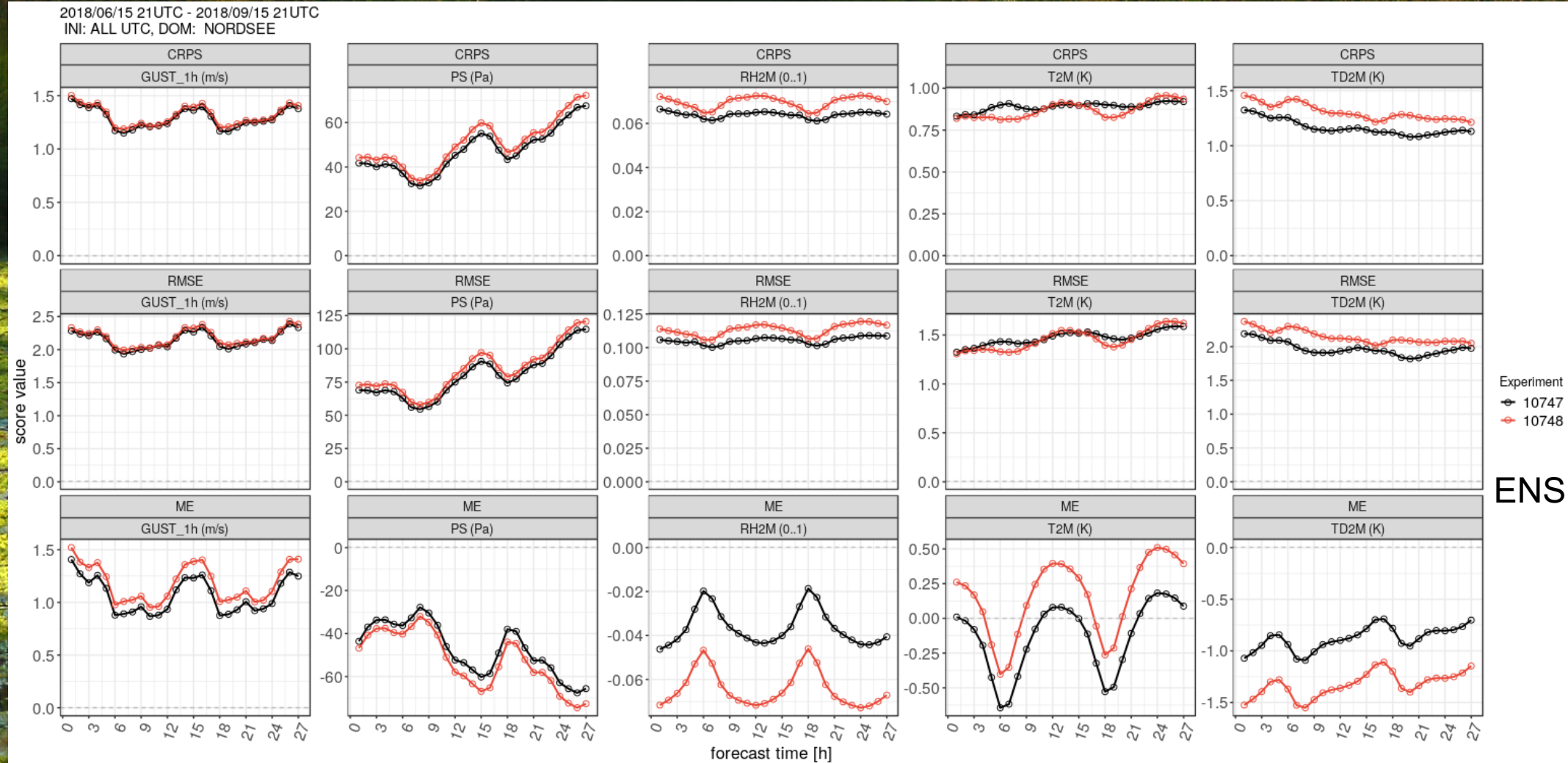
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Lütt-Witt Moor, Henstedt-Ulzburg, Germany - Wikipedia

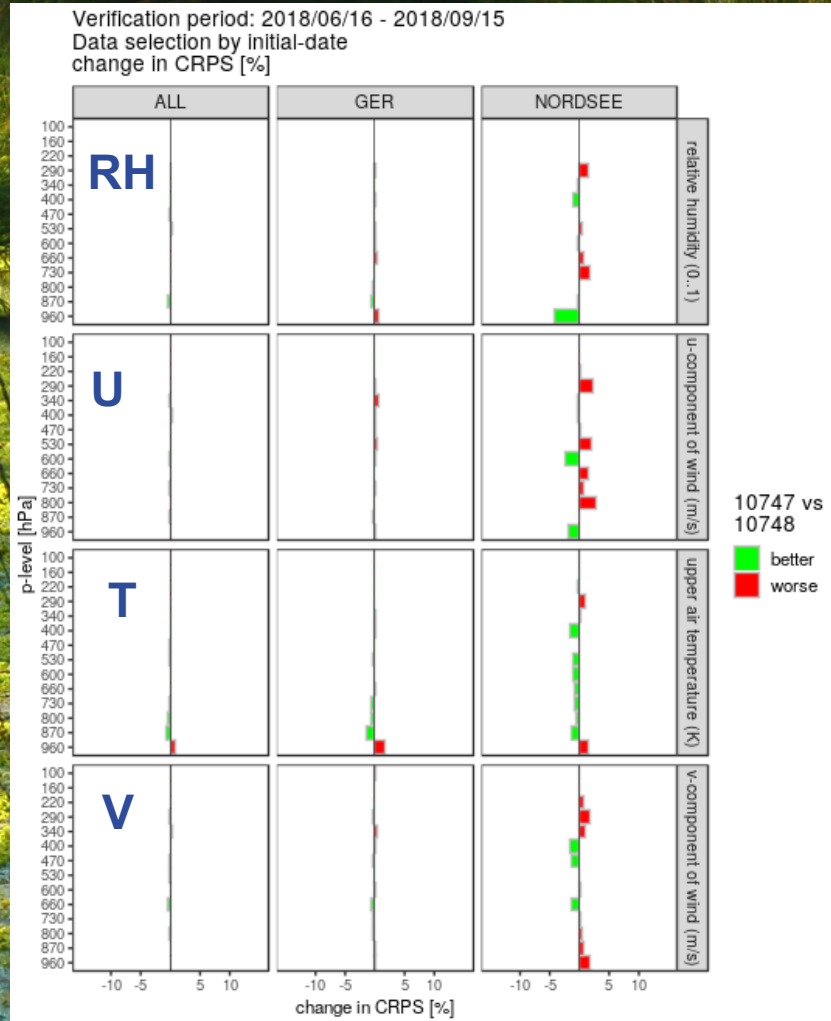


Verification – COSMO-D2



Verification – COSMO-D2

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ENS



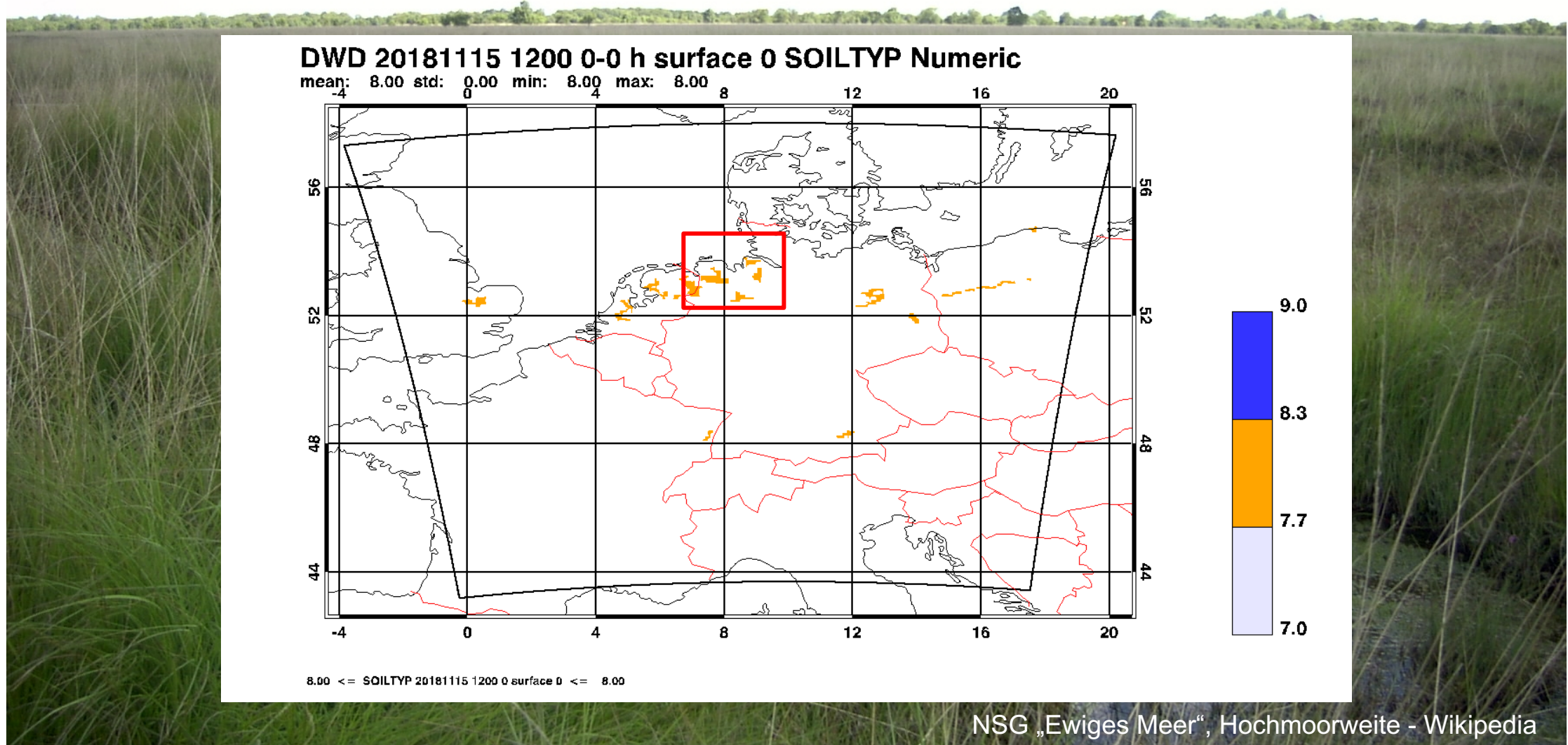


- Mire parameterization developed in COSMO framework
- Contribution by Hydrometeorological Centre of Russia
- With version 5.06 COSMO now first op. NWP system considering peatlands in a special scheme
- Current limitations: fast but simple scheme: evapotranspiration, fixed water table, dry bogs not captured
- However, experiment verification showed some positive impact from Mire parameterization in COSMO-D2
- Further tests in COSMO partner domains are ongoing (RHM)
- Will be further tested in ICON-(LAM)

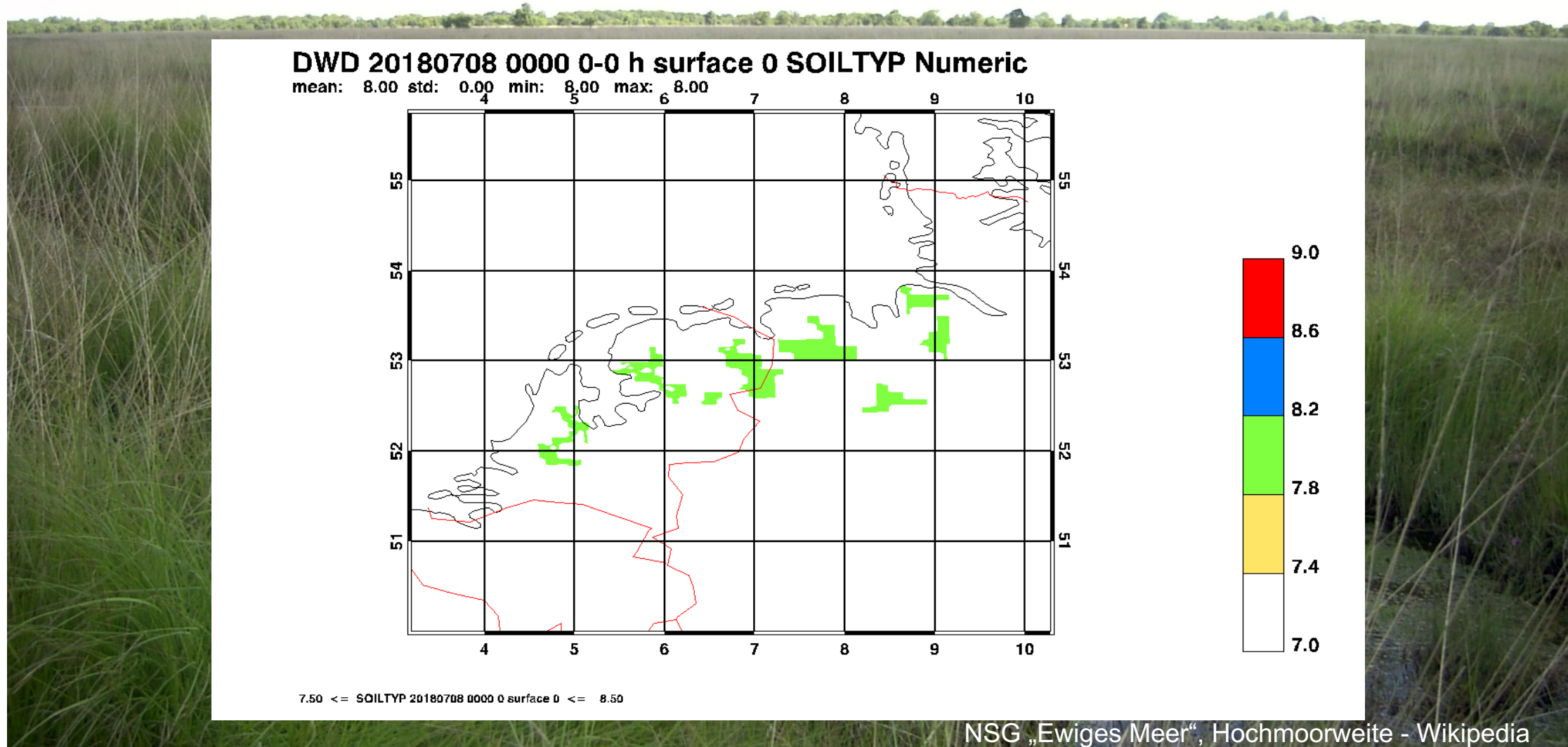
Outlook

Formerly peat bog, recultivated as a wetland near Sitniki, Russia - Wikipedia

Peatlands in COSMO-D2



Peatlands in COSMO-D2

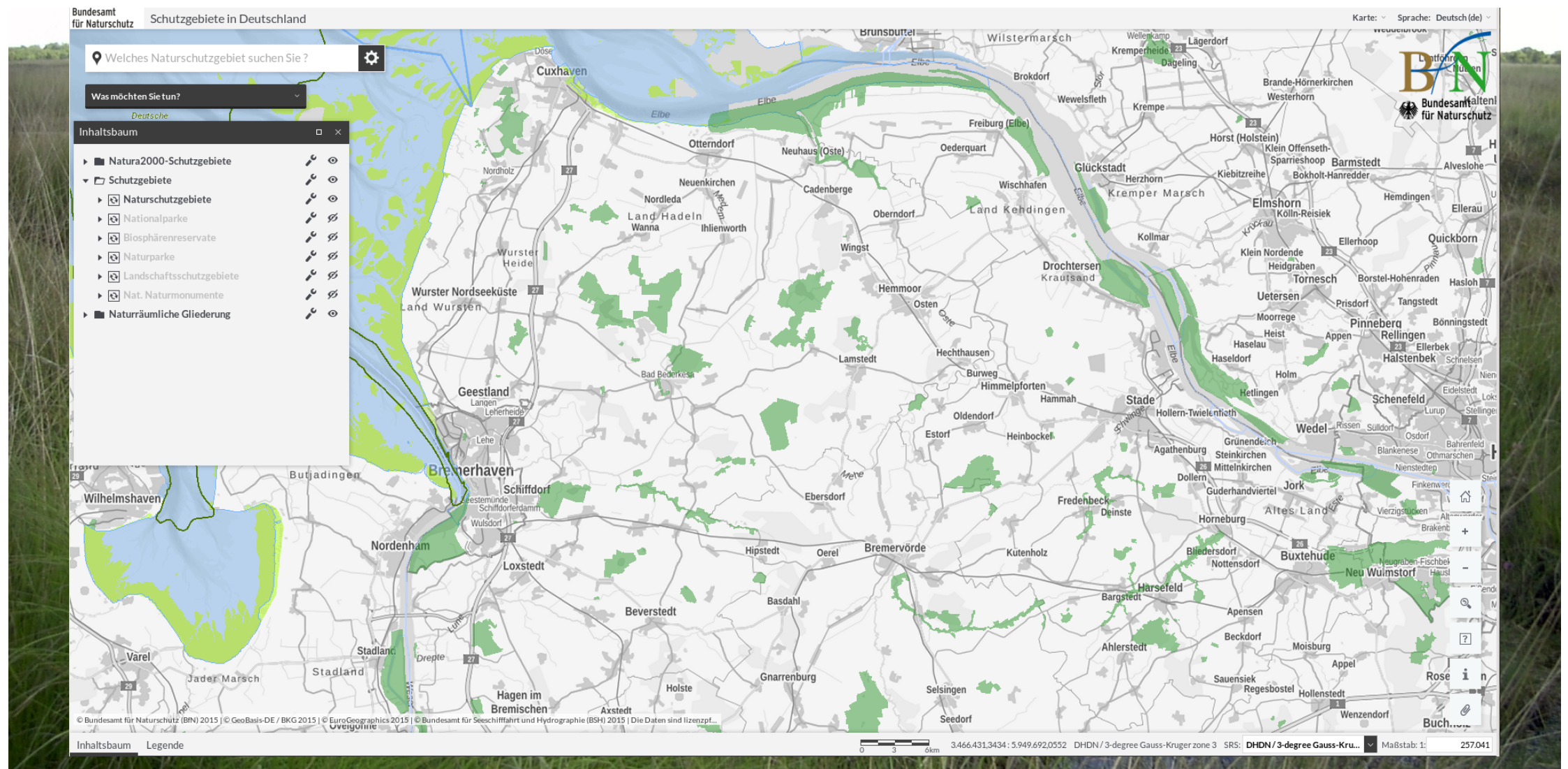


External parameter for peatlands



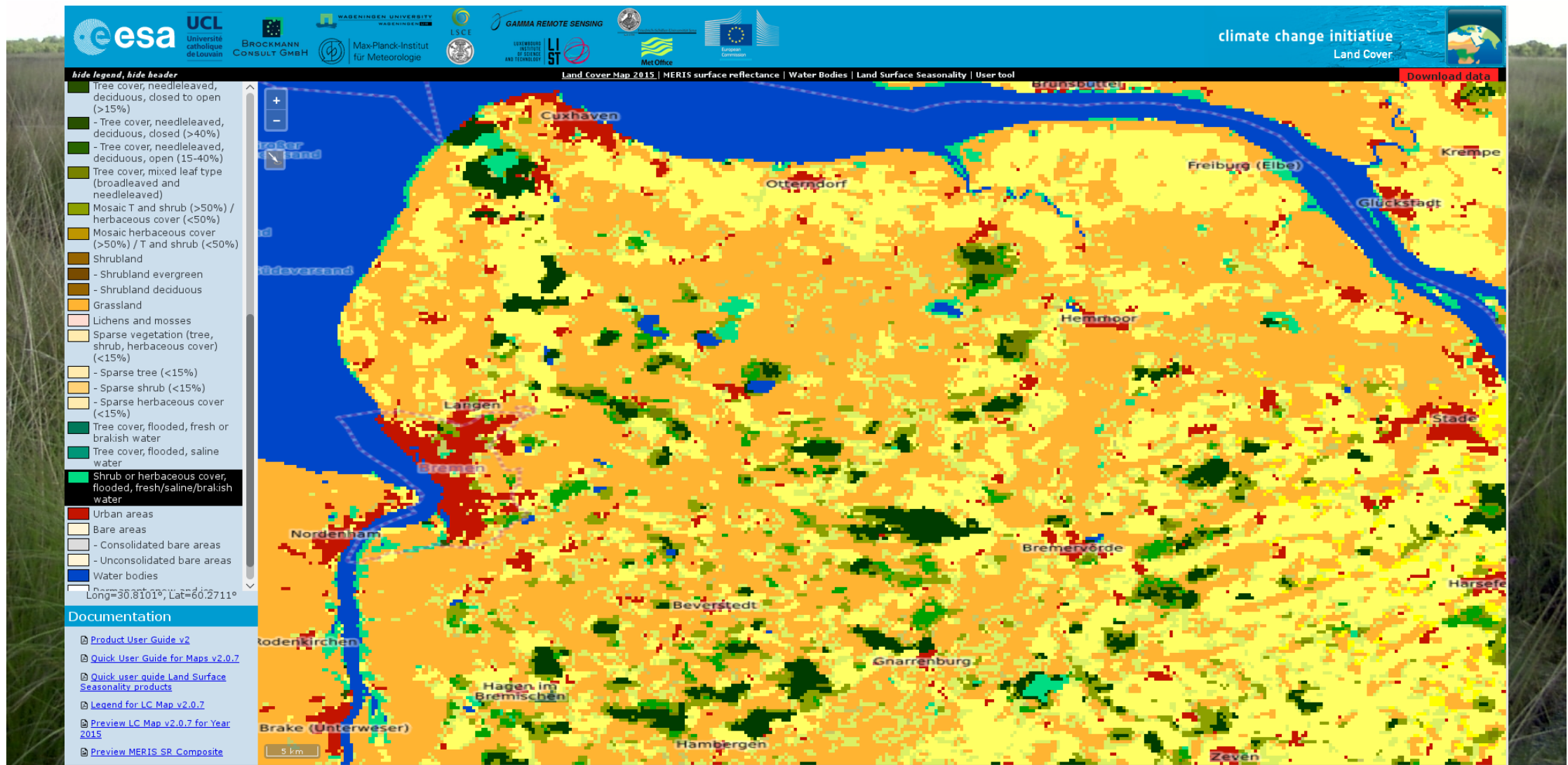
External parameter for peatlands

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



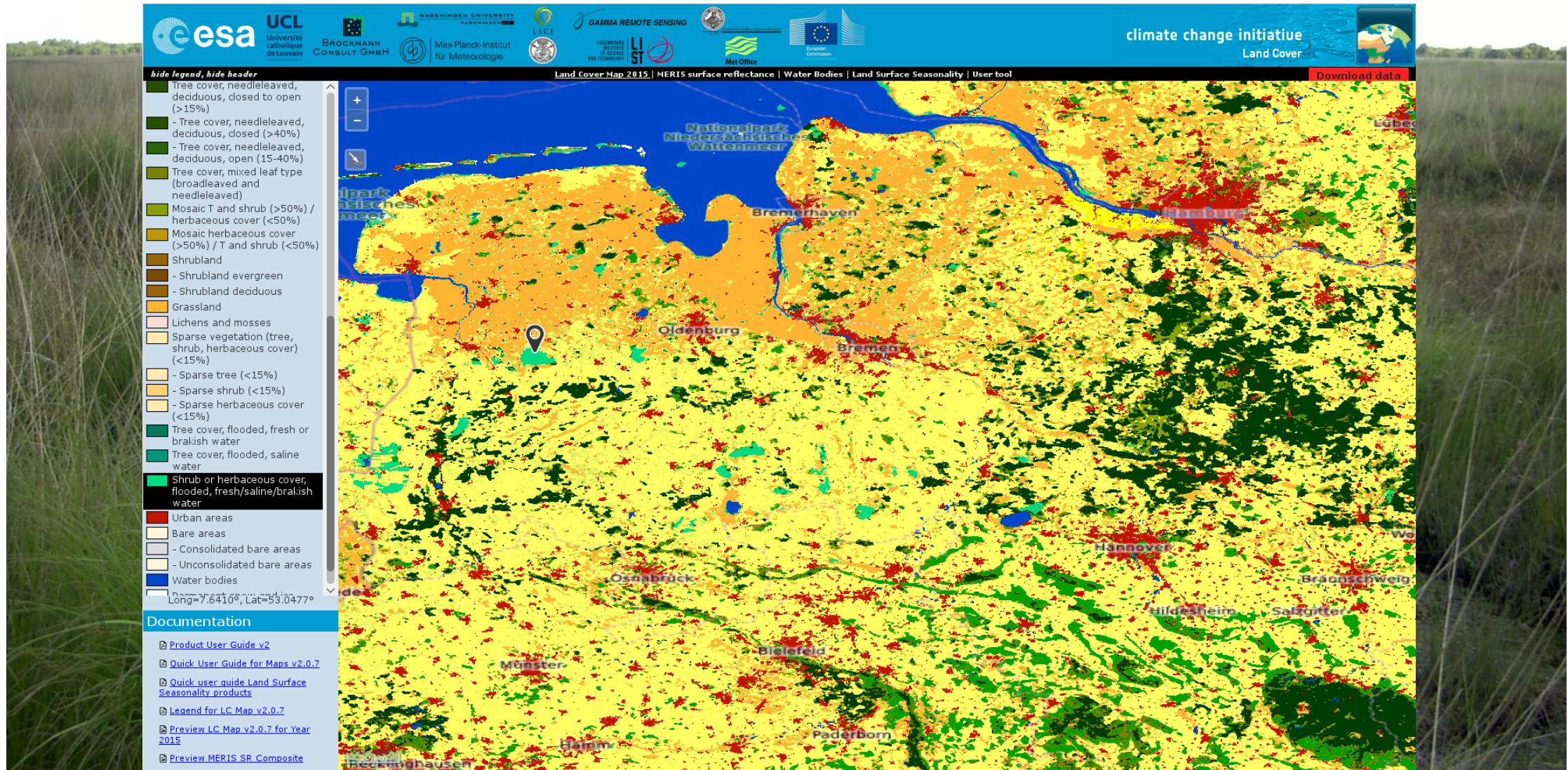
External parameter for peatlands

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

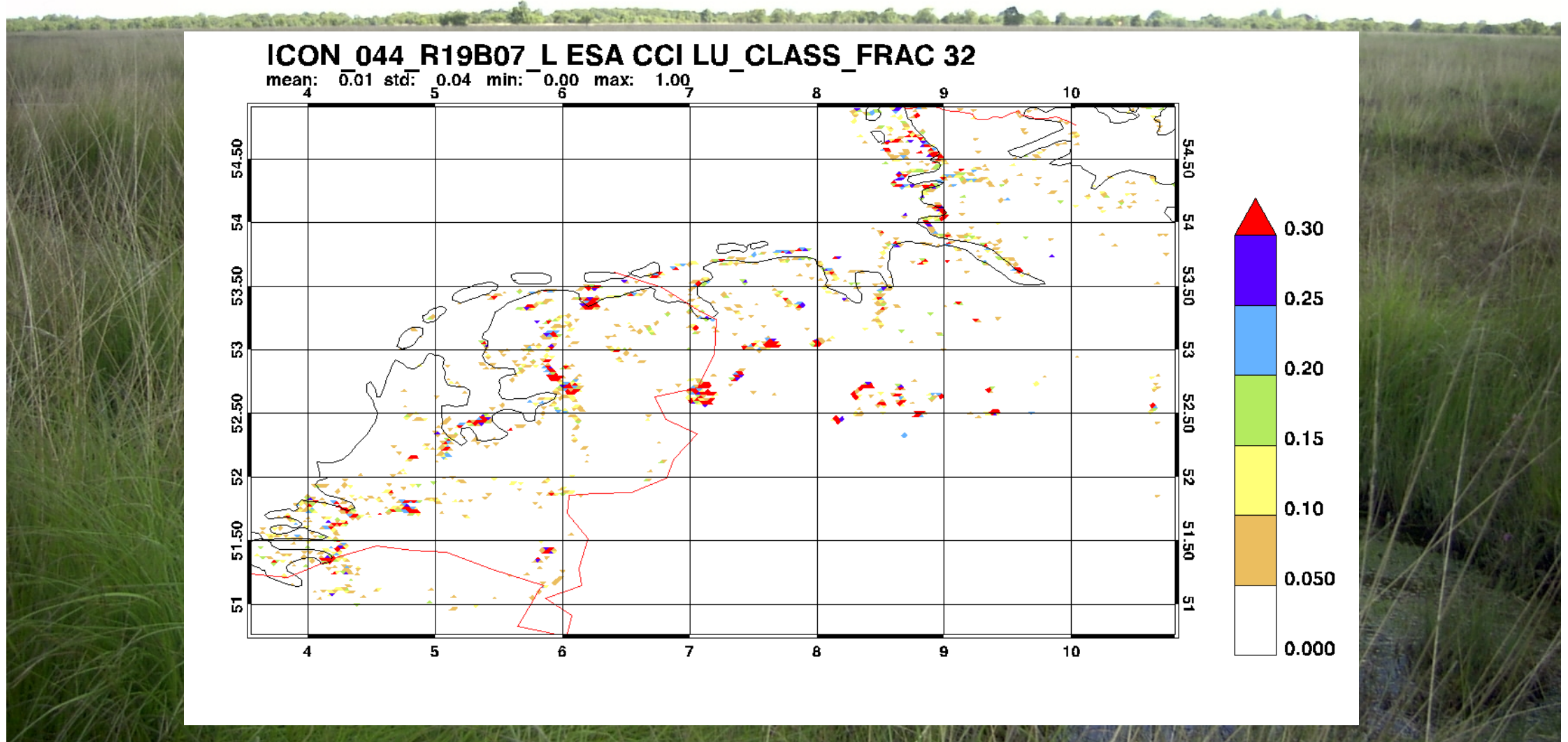


External parameter for peatlands

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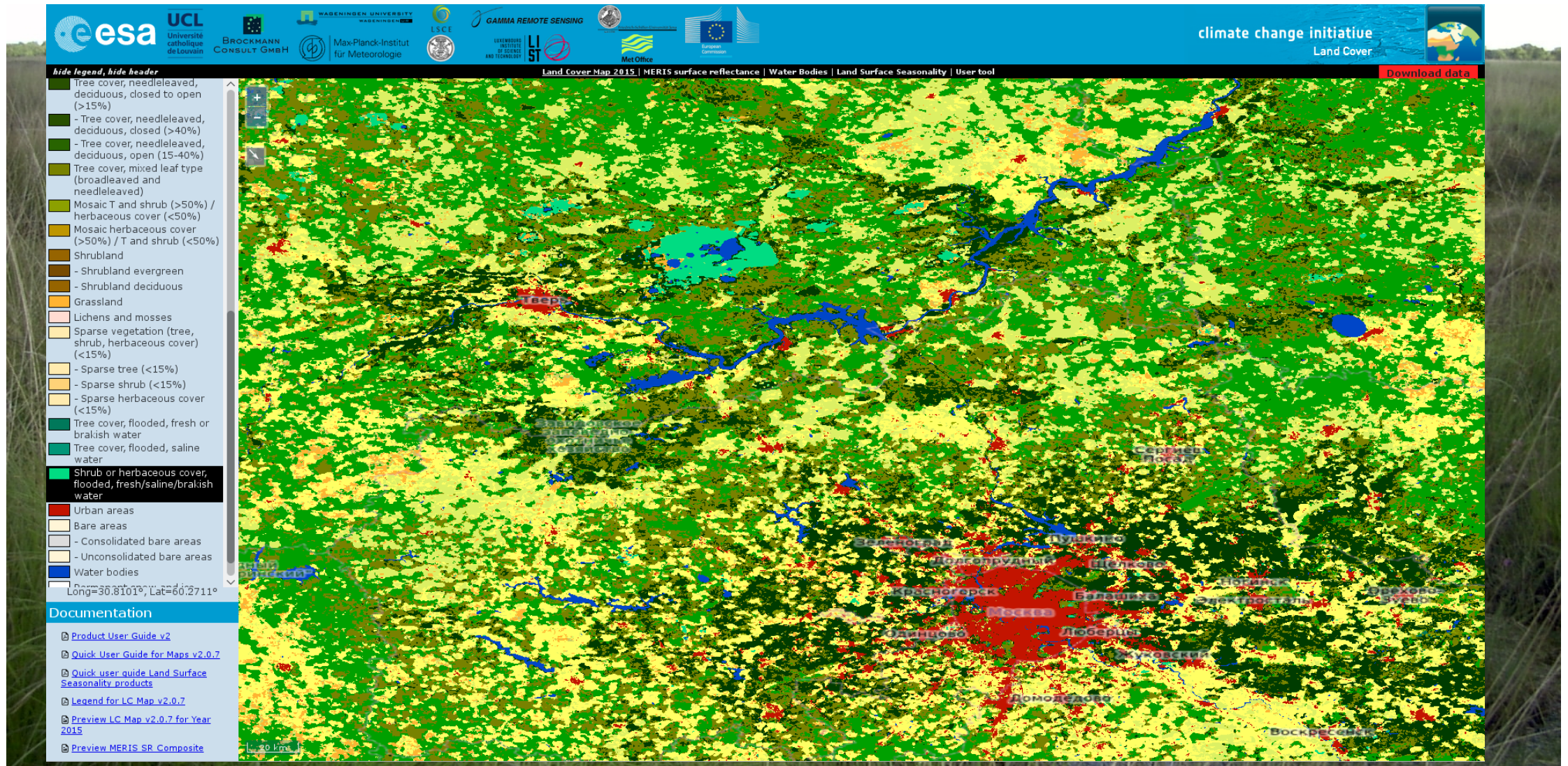


Peatlands – ICON R19B07



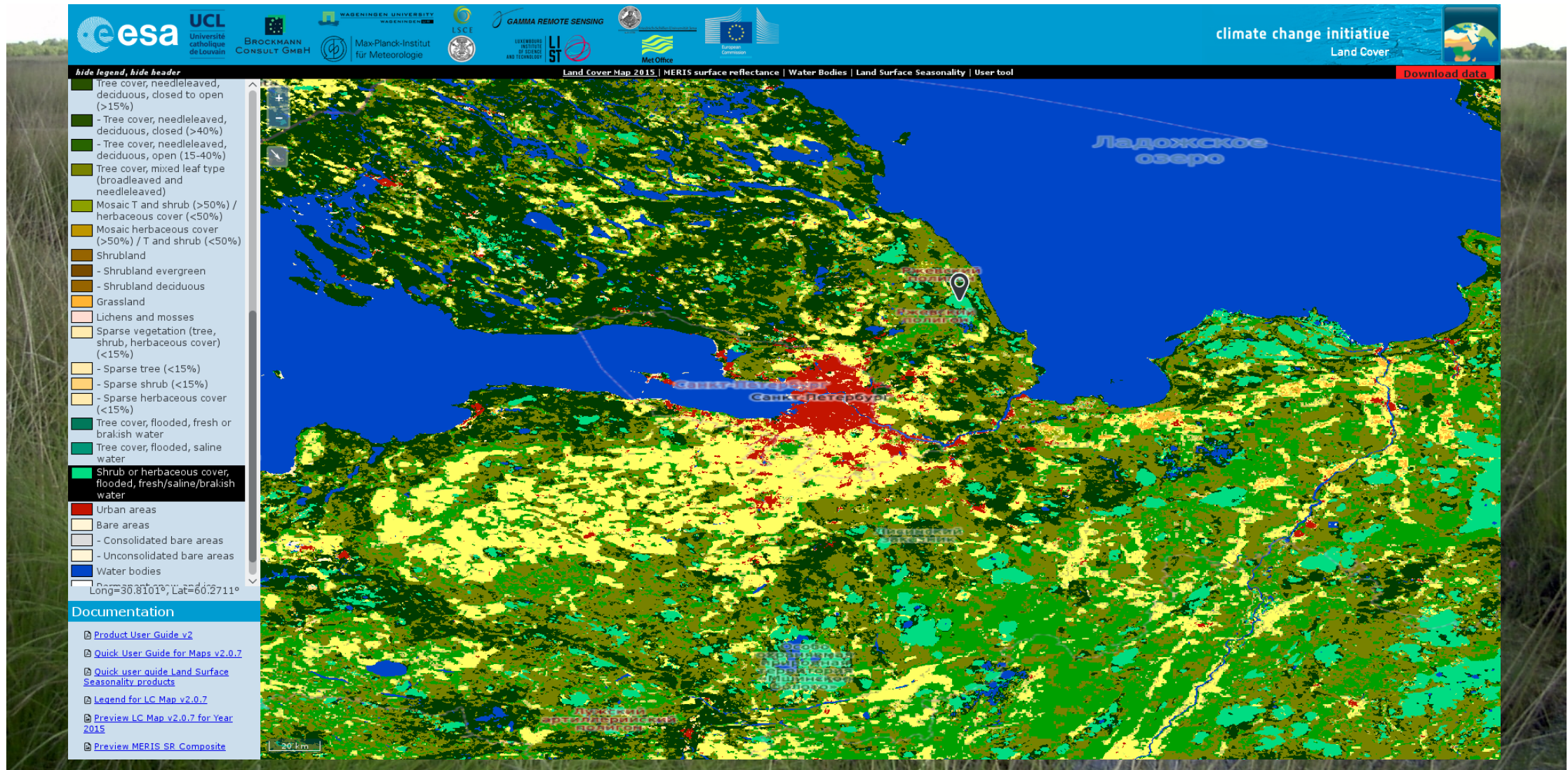
External parameter for peatlands

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

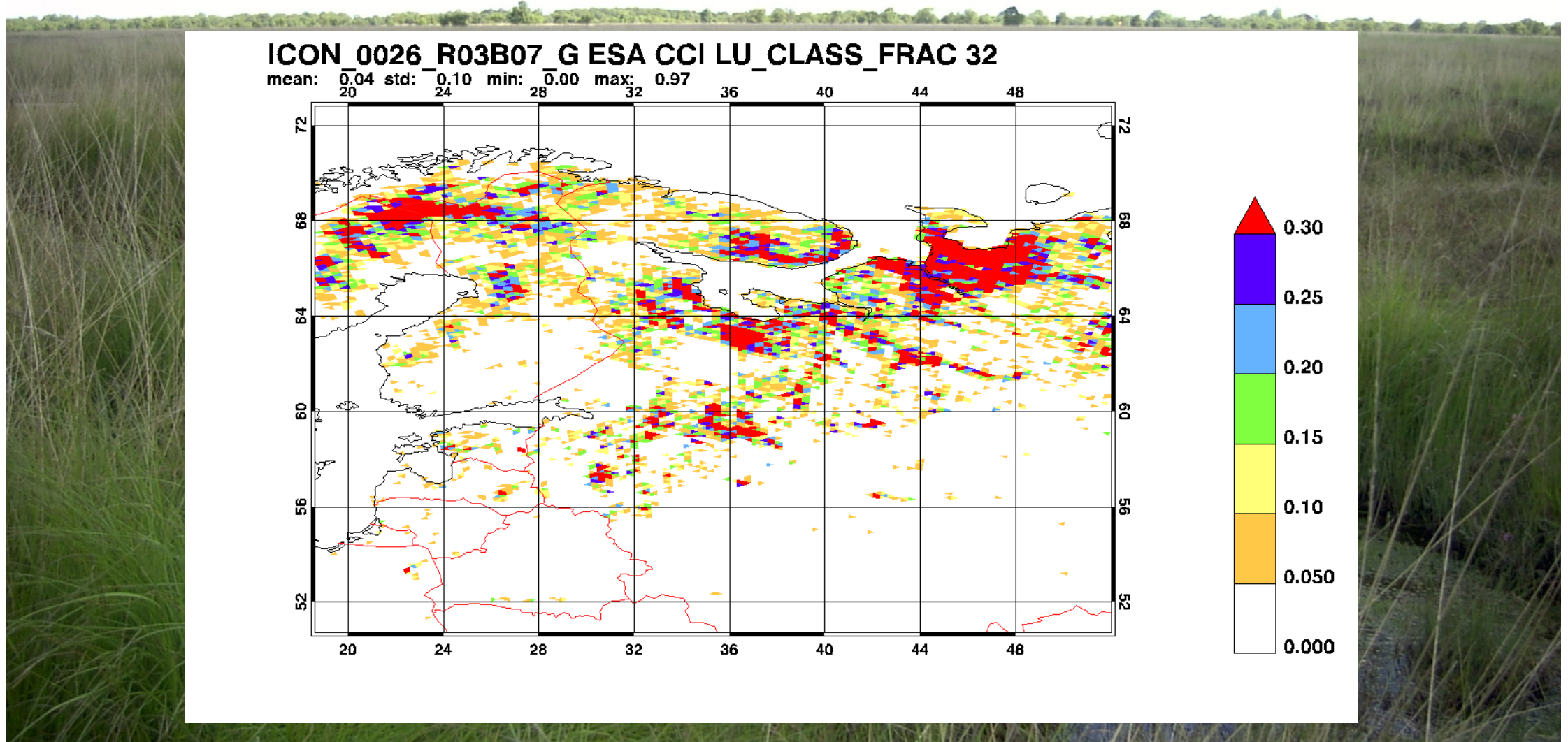


External parameter for peatlands

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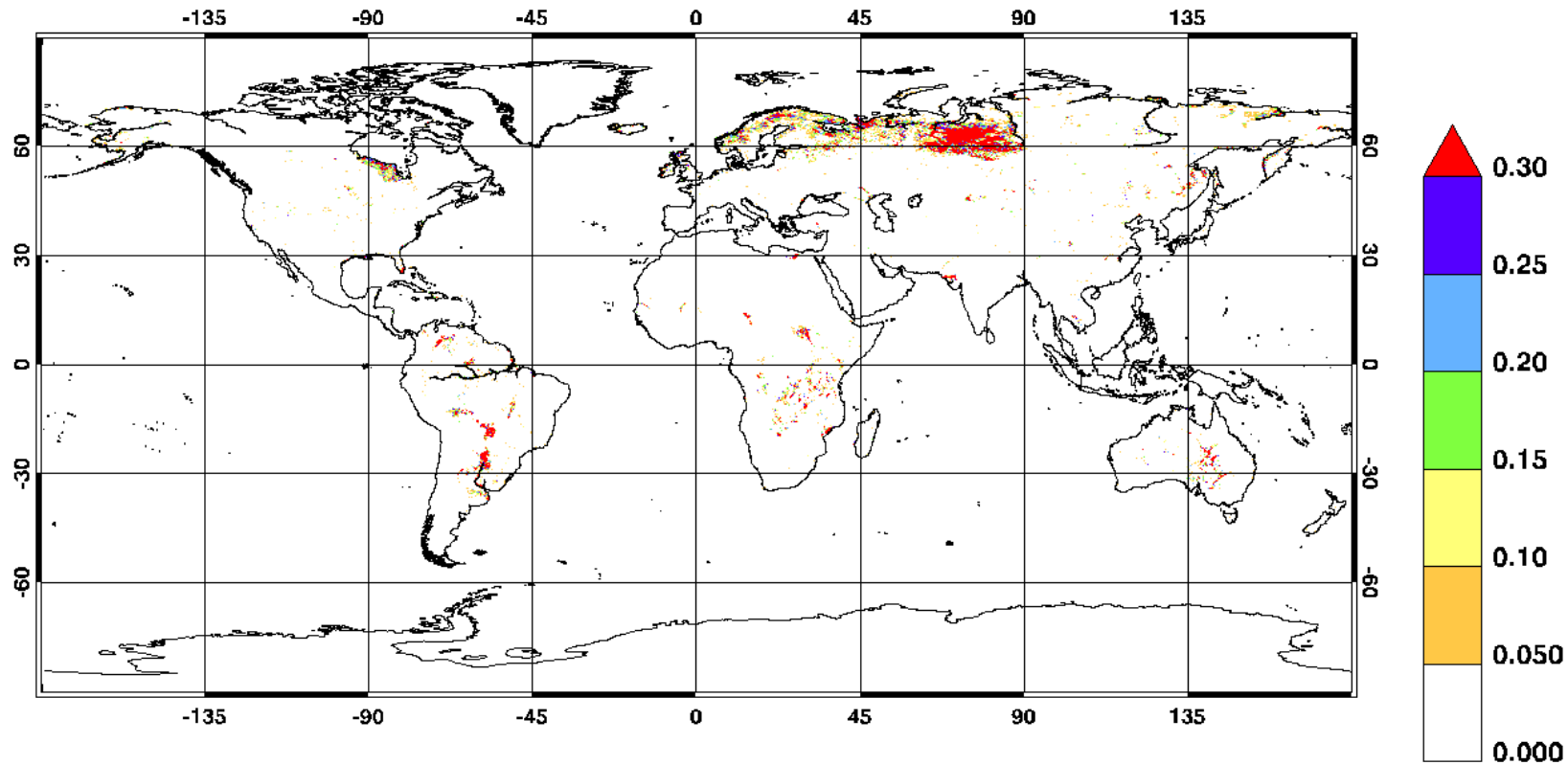
Peatlands – ICON R03B07



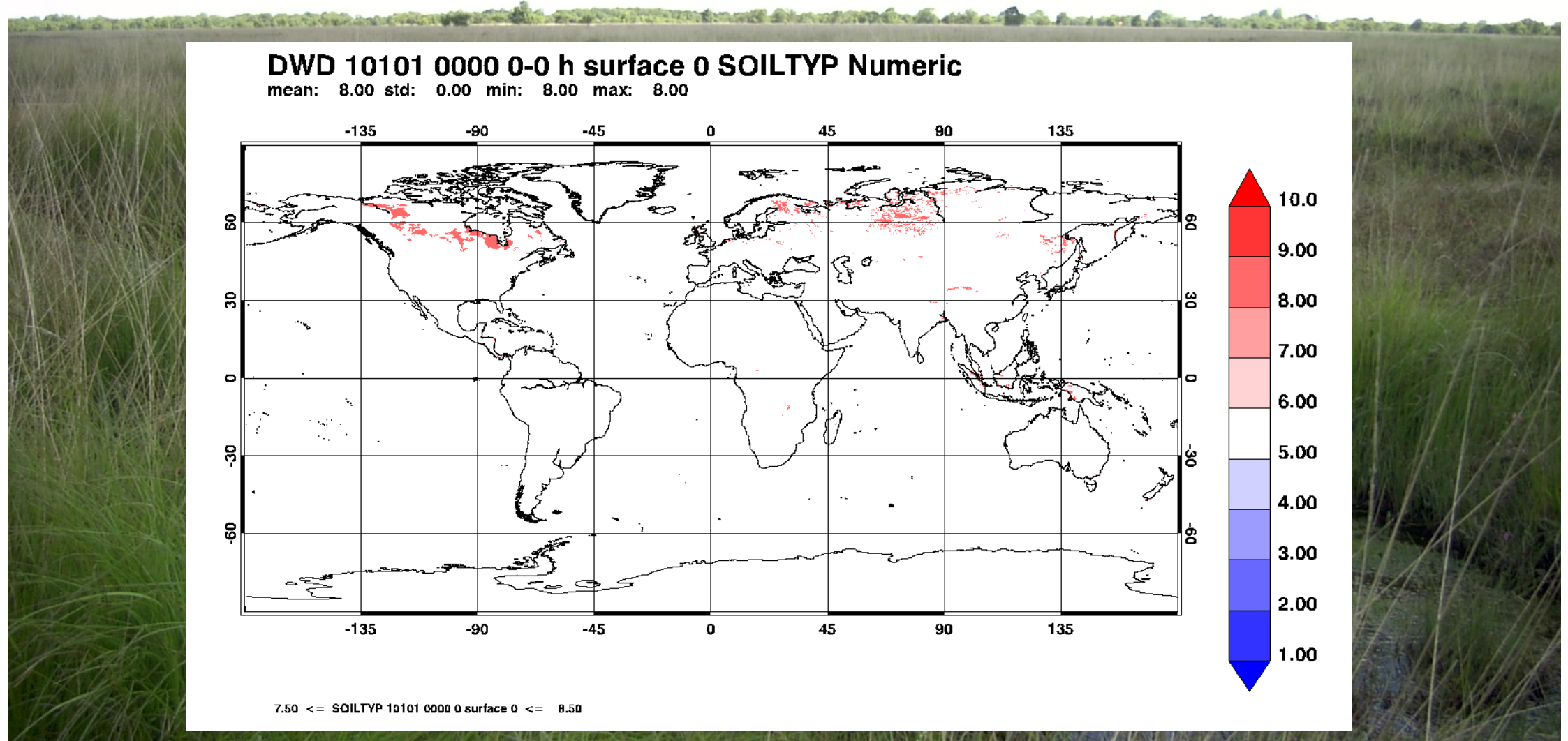
Peatlands – ICON R19B07

ICON_0026_R03B07_G ESA_CCI_LU_CLASS_FRAC_32

mean: 0.00 std: 0.04 min: 0.00 max: 1.00



Peatlands – ICON R03B07



Peatlands - Map

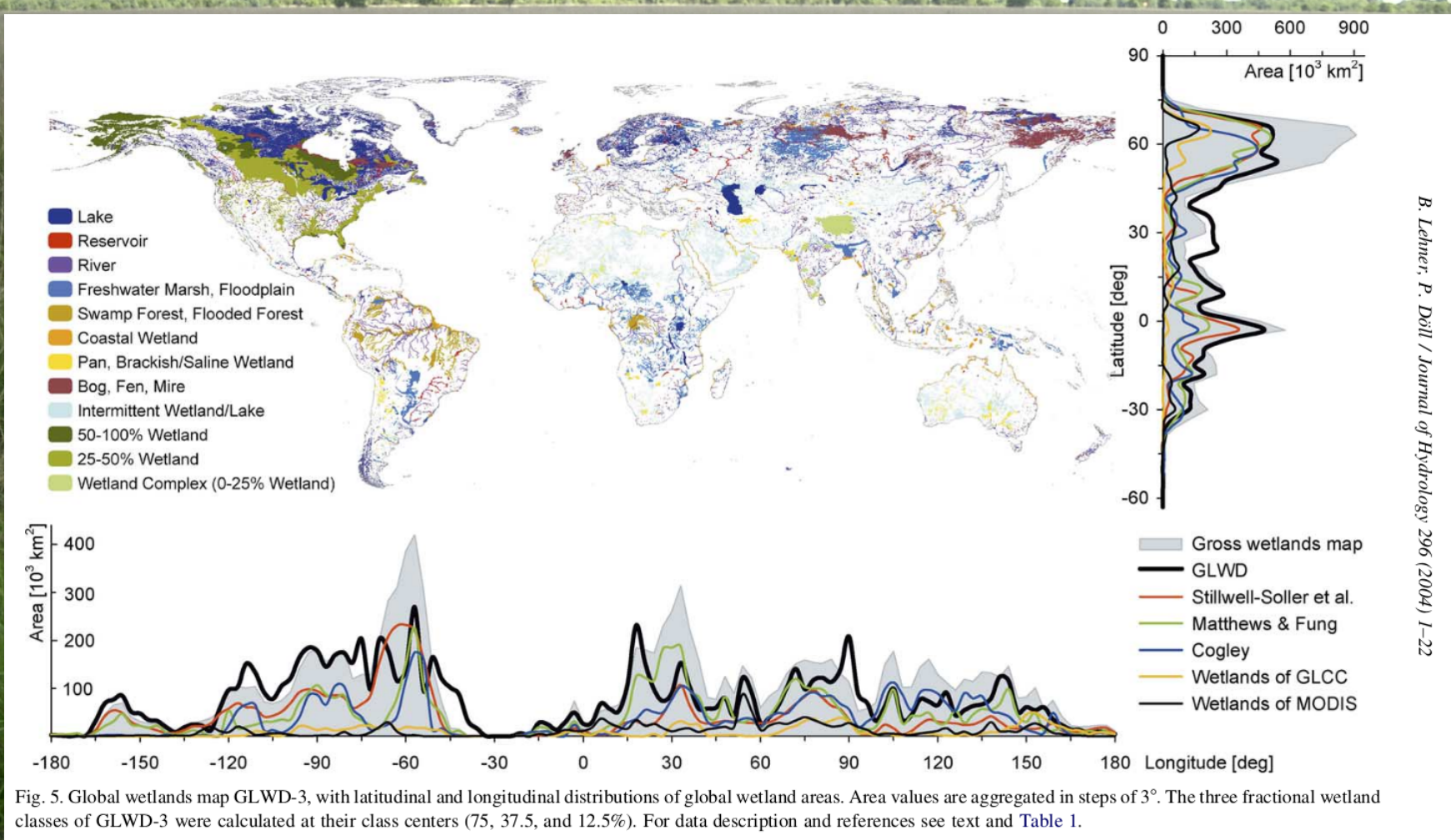


Fig. 5. Global wetlands map GLWD-3, with latitudinal and longitudinal distributions of global wetland areas. Area values are aggregated in steps of 3° . The three fractional wetland classes of GLWD-3 were calculated at their class centers (75, 37.5, and 12.5%). For data description and references see text and Table 1.