9th European Conference
on Severe Storms
18-22th September
Pula, Croatia

Climatological aspects of convective parameters over Europe: a comparison of ERA-Interim and sounding data

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Department of Climatology

[3] Skywarn Poland
Polish Stormchasing Society

[2] NOAA
National Severe Storms Laboratory

[4] Cracow University of Technology

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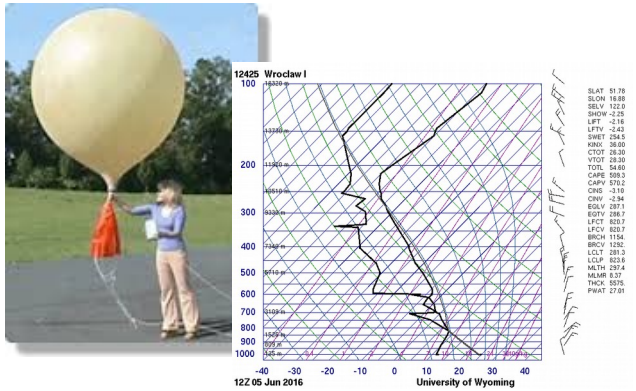
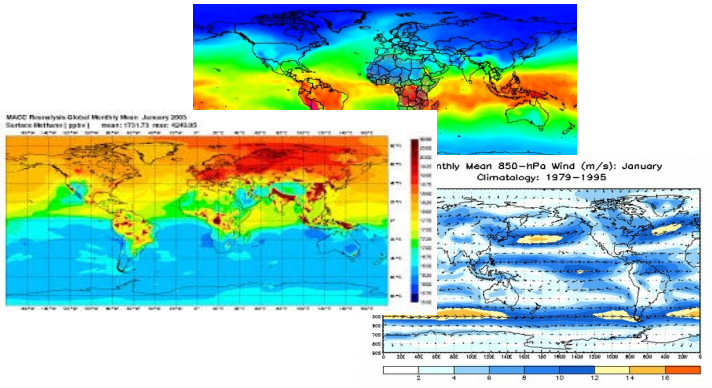
Computations were performed in Poznan Supercomputing and Networking Center.

Atmospheric soundings



Reanalysis



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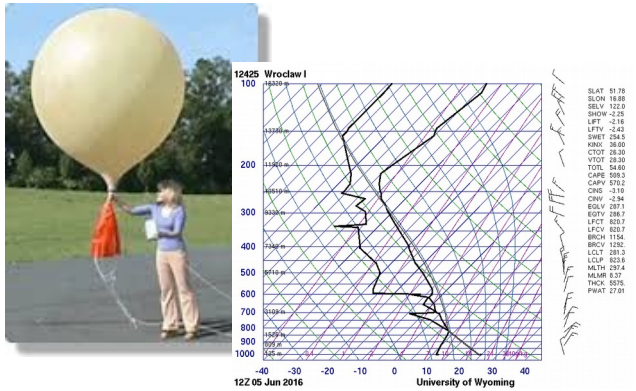

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- detailed data (> 50 levels)

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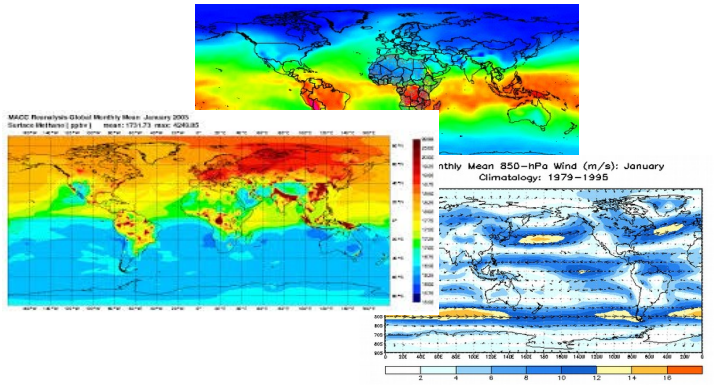

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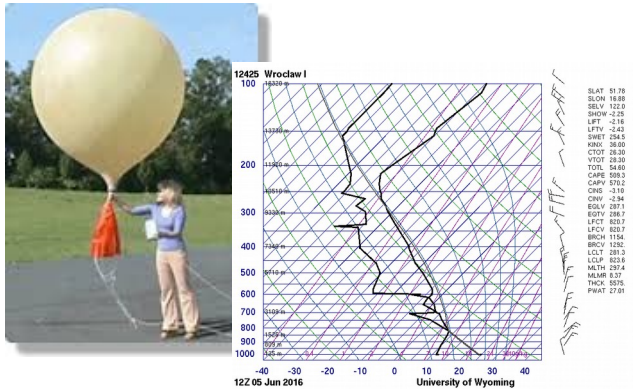

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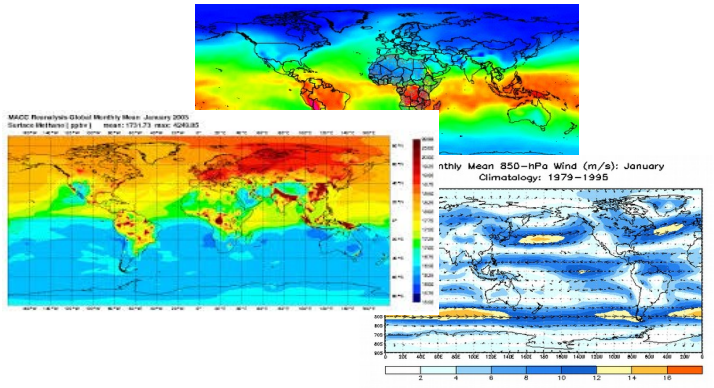

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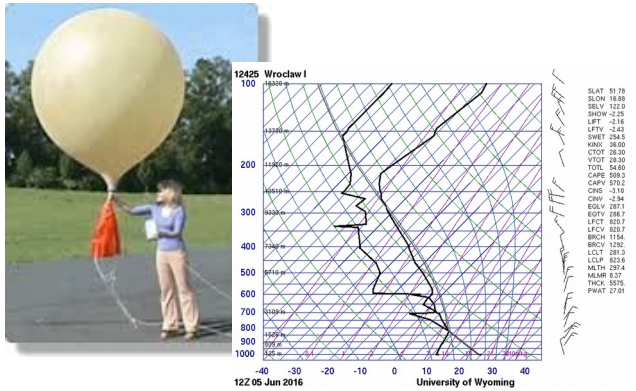

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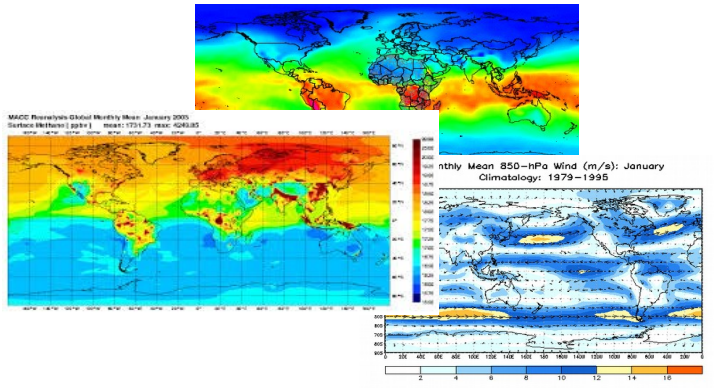

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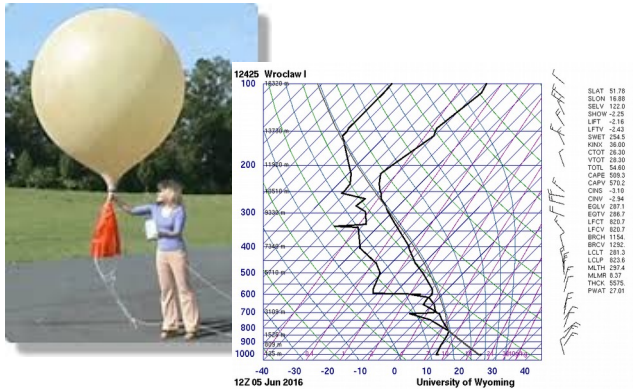

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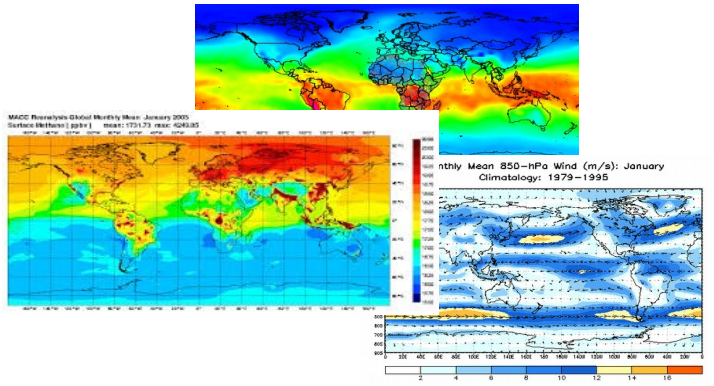

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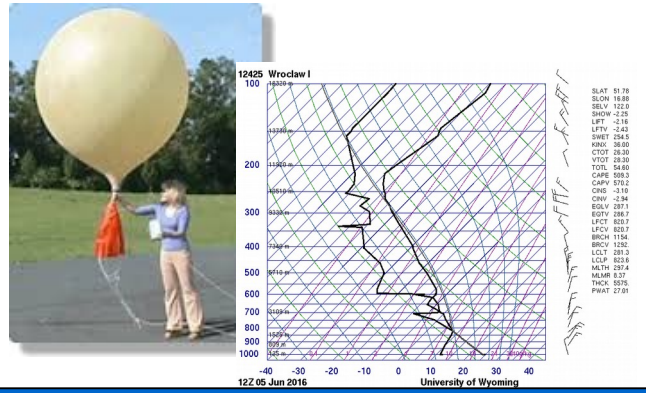

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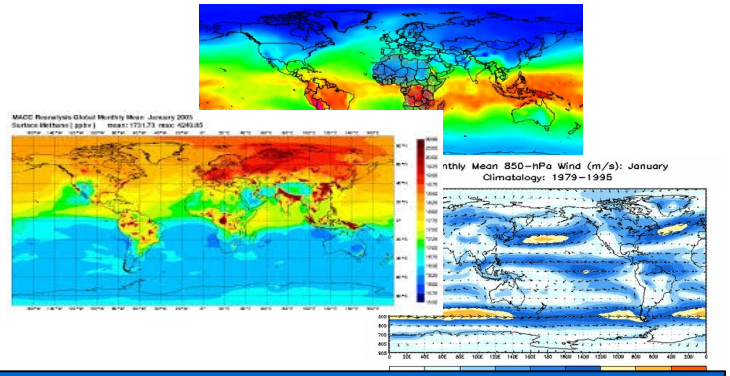

… but how good is the reanalysis in sampling a real convective environment?

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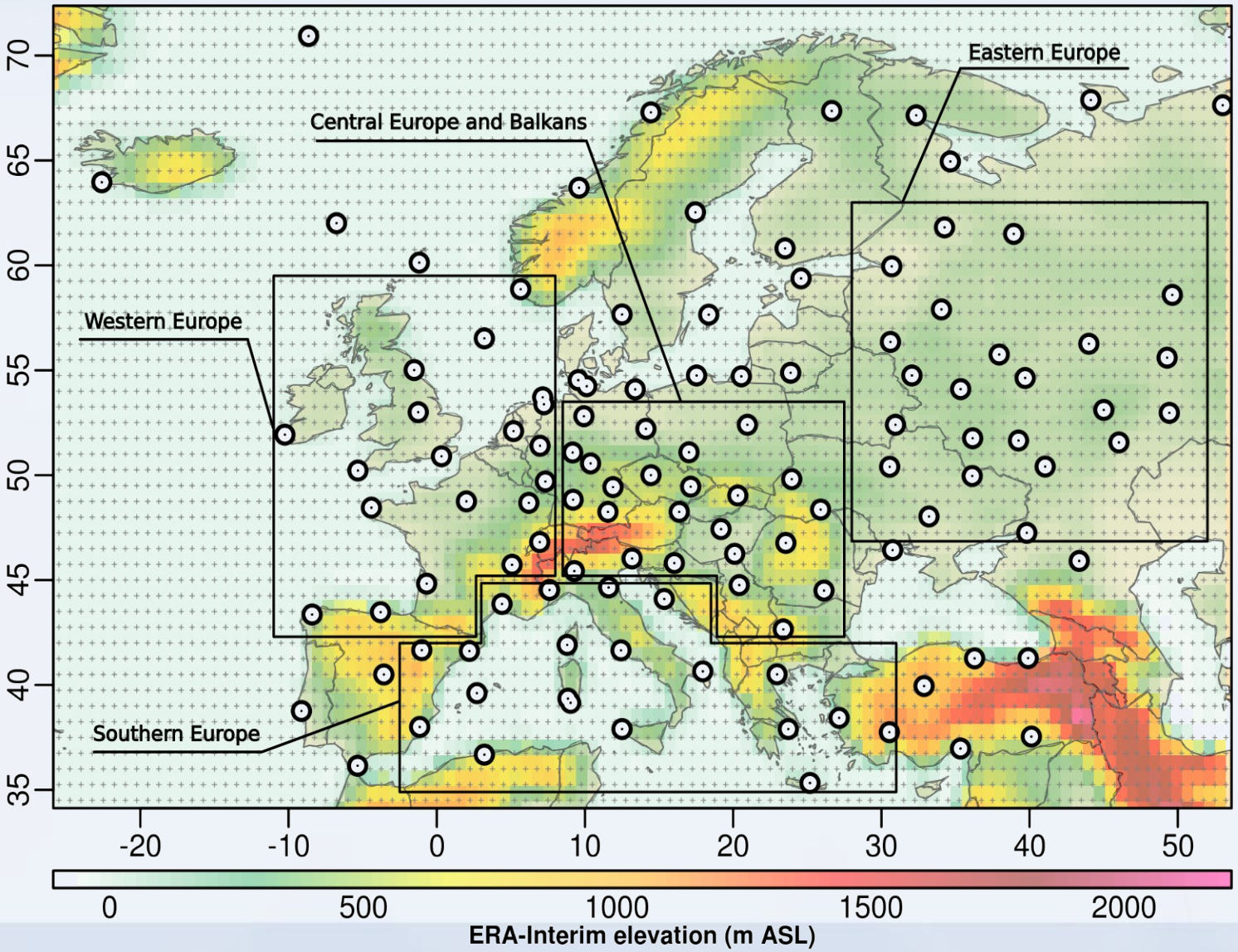
3. Which areas in Europe are the most prone to (severe) thunderstorms?

Research area and datasets

1. Observations

- 1 100 000 atmospheric soundings for 12 UTC (119 stations)



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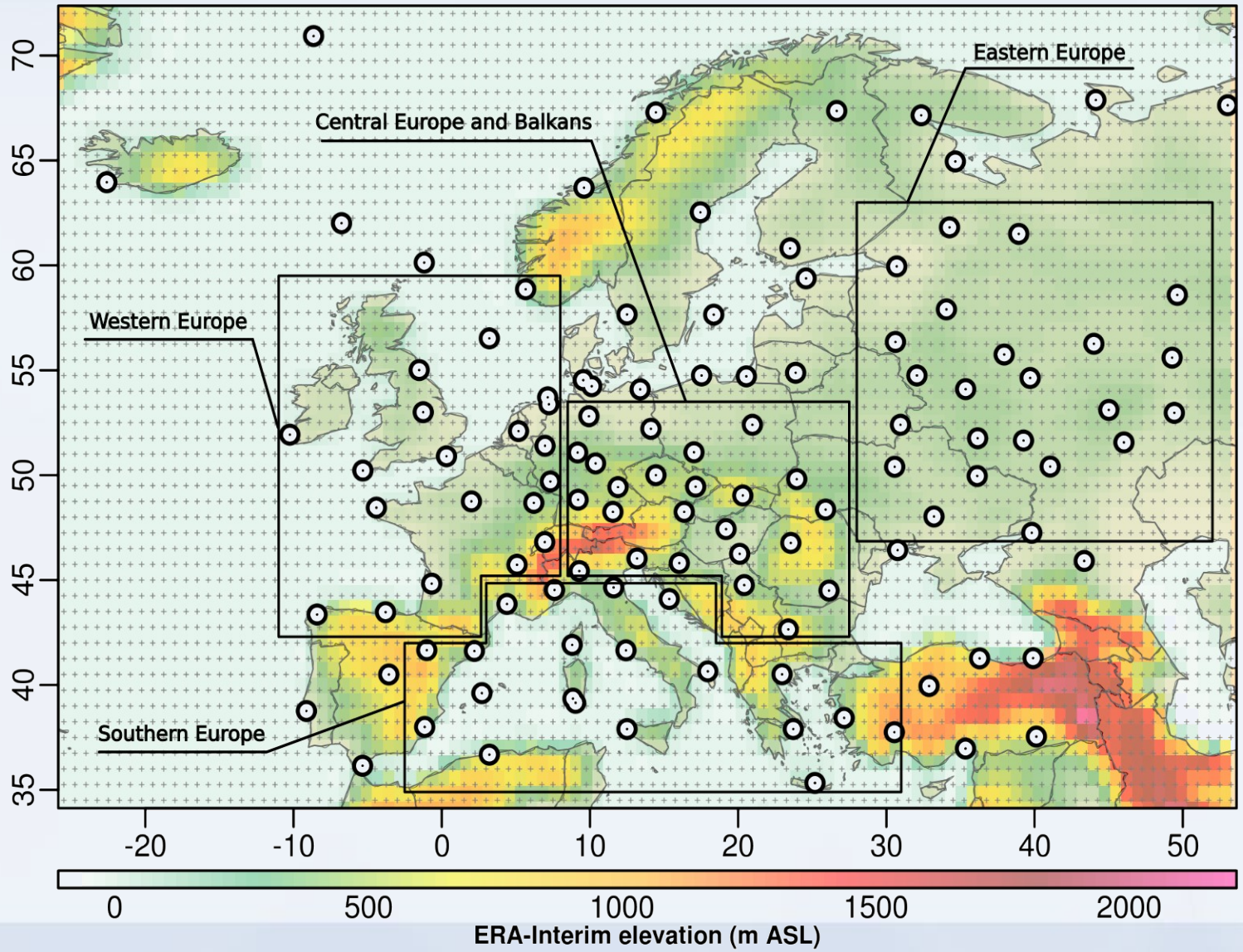

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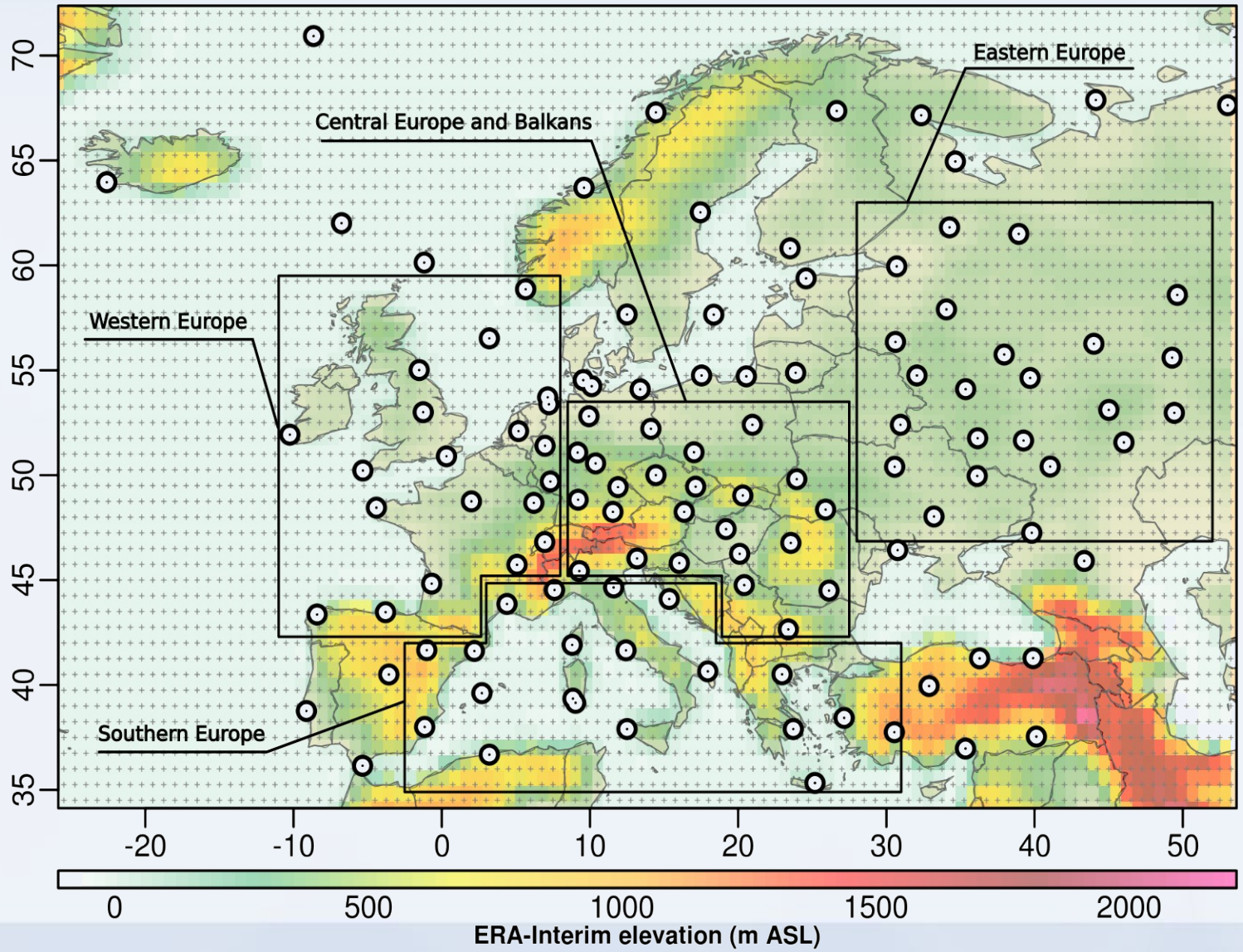

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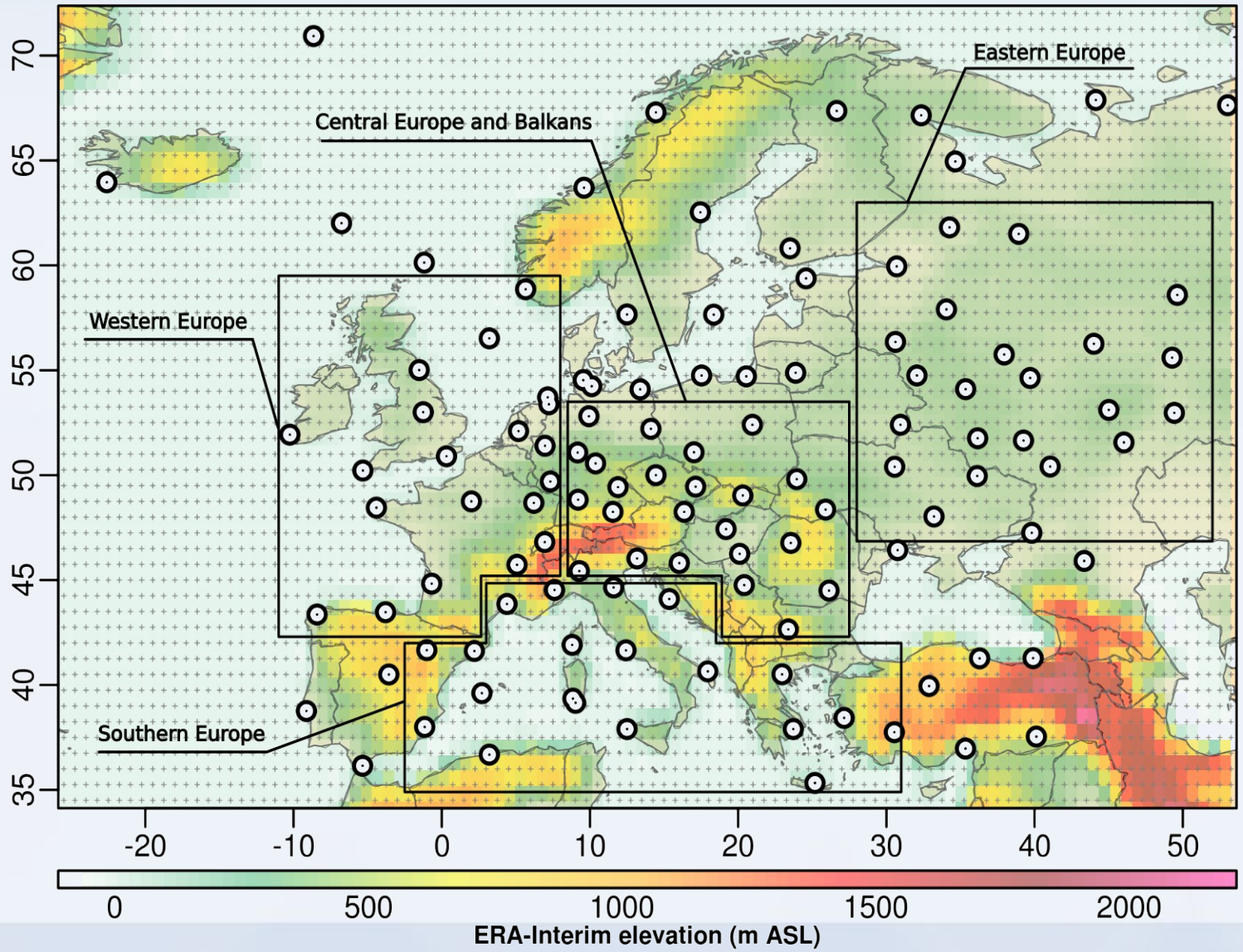
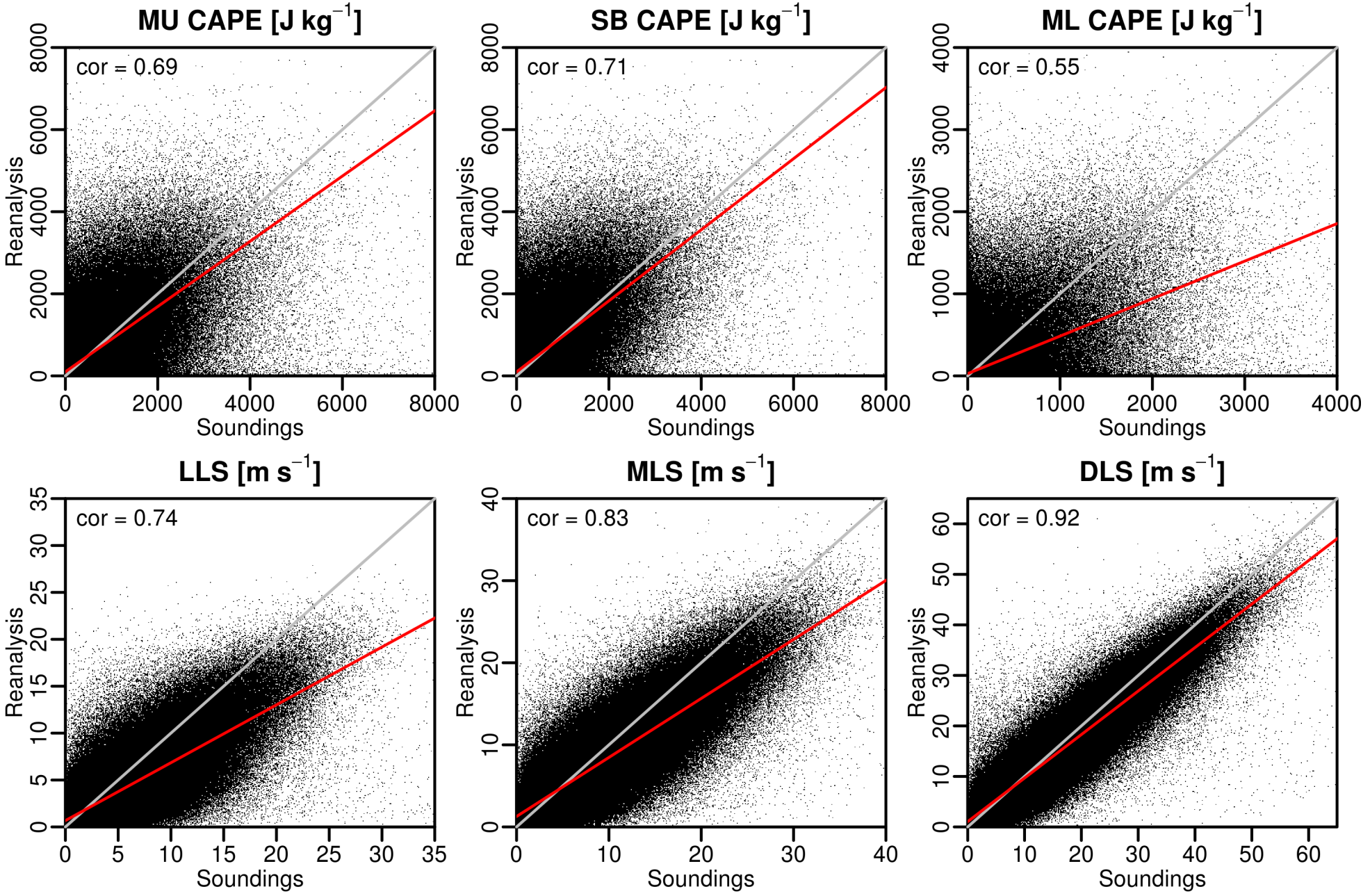
4. Spatial division
- Western Europe
- Central Europe and Balkans
- Southern Europe
- Eastern Europe



Results

Observations vs reanalysis



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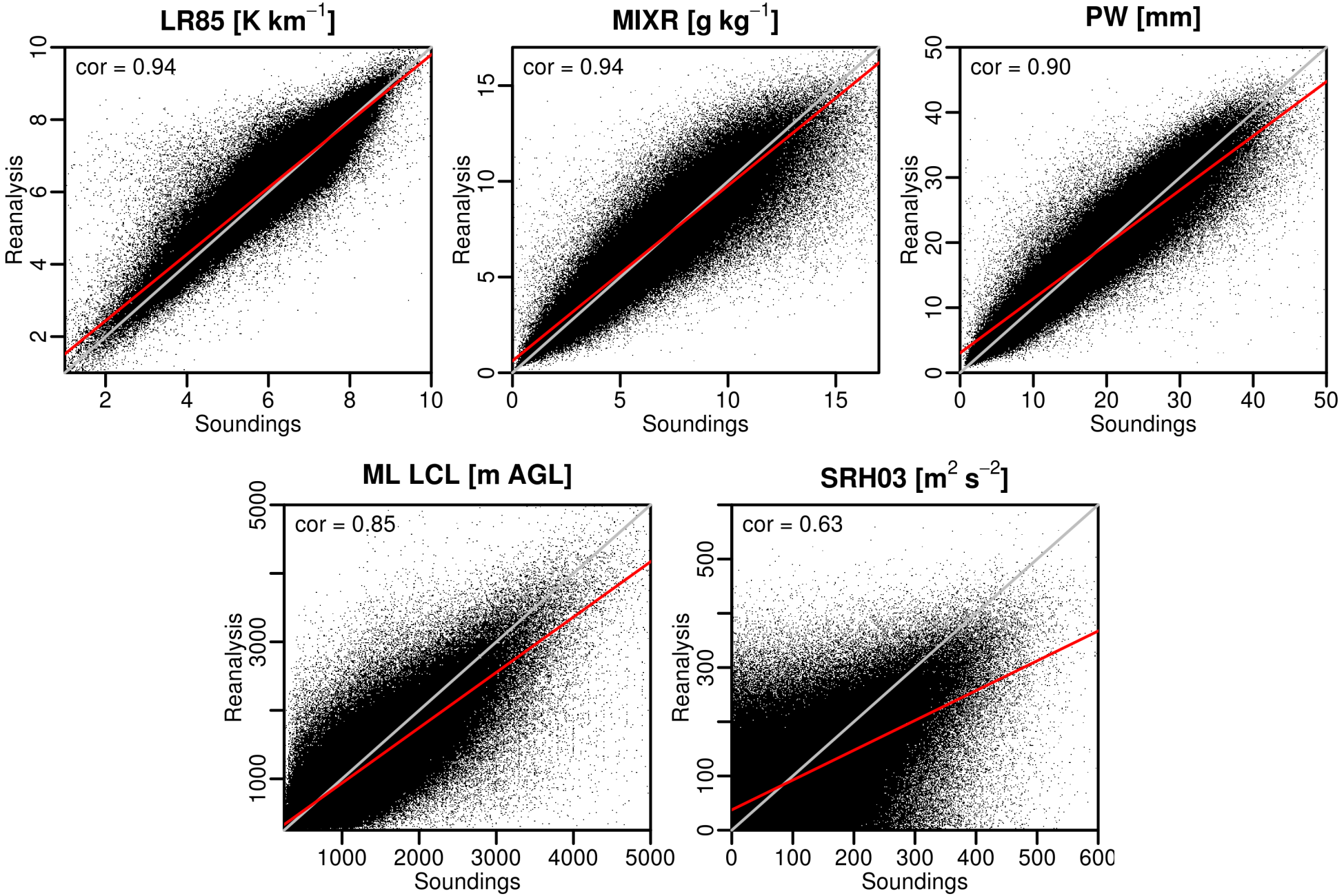

Observations vs reanalysis

Table 1. Mean errors and mean percentage errors of ERA-Interim relative to sounding measurements (1 mln cases).

	Mean error (mean percentage error)				
	Western EU	Central EU & Balkans	Eastern EU	Southern EU	All
MIXR [g kg^{-1}]	0.17 (2.9%)	0.14 (2.5%)	0.11 (2.3%)	0.24 (3.4%)	0.15 (2.7%)
LR85 [K km^{-1}]	0.13 (2.2%)	0.14 (2.3%)	0.03 (0.5%)	0.12 (1.8%)	0.11 (1.9%)
MU CAPE [J kg^{-1}]	27.28 (19.5%)	77.06 (35.2%)	-30.13 (-14.1%)	239.11 (46.9%)	55.22 (24.6%)
SB CAPE [J kg^{-1}]	30.02 (21.4%)	85.95 (40.6%)	-3.89 (-2.1%)	259.99 (53.5%)	69.73 (33.1%)
ML CAPE [J kg^{-1}]	2.12 (5.5%)	-4.05 (-5.4%)	-32.03 (-36.9%)	-2.89 (-2.5%)	-9.28 (-13.6%)
DLS [m s^{-1}]	-1.28 (-7.8%)	-1.12 (-7.2%)	-1.30 (-8.5%)	-0.81 (-5.5%)	-1.09 (-7.0%)
MLS [m s^{-1}]	-1.59 (-15.7%)	-1.40 (-14.4%)	-1.63 (-16.6%)	-1.37 (-14.3%)	-1.46 (-15.0%)
LLS [m s^{-1}]	-1.83 (-28.4%)	-1.51 (-25.9%)	-1.60 (-24.9%)	-1.69 (-33.7%)	-1.61 (-26.9%)
SRH03 [m^2 s^{-2}]	-14.30 (-11.9%)	-13.79 (-12.1%)	-15.15 (-13.2%)	-14.36 (-12.9%)	-13.81 (-12.1%)
ML LCL [m AGL]	-66.28 (-7.2%)	-73.55 (-6.4%)	-80.55 (-6.8%)	-186.57 (-12.3%)	-91.98 (-7.9%)
PW [mm]	0.62 (4.0%)	0.44 (2.8%)	0.69 (4.7%)	0.17 (0.9%)	0.47 (3.1%)
ML CIN [J kg^{-1}]	4.18 (38.6%)	5.36 (33.9%)	2.81 (24.0%)	11.08 (19.1%)	5.27 (25.7%)
ML WMAXSHEAR [m^2 s^{-2}]	-6.21 (-9.0%)	-11.67 (-15.5%)	-22.59 (-32.5%)	-8.76 (-8.8%)	-10.41 (-15.0%)

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Mean values (1979-2016)

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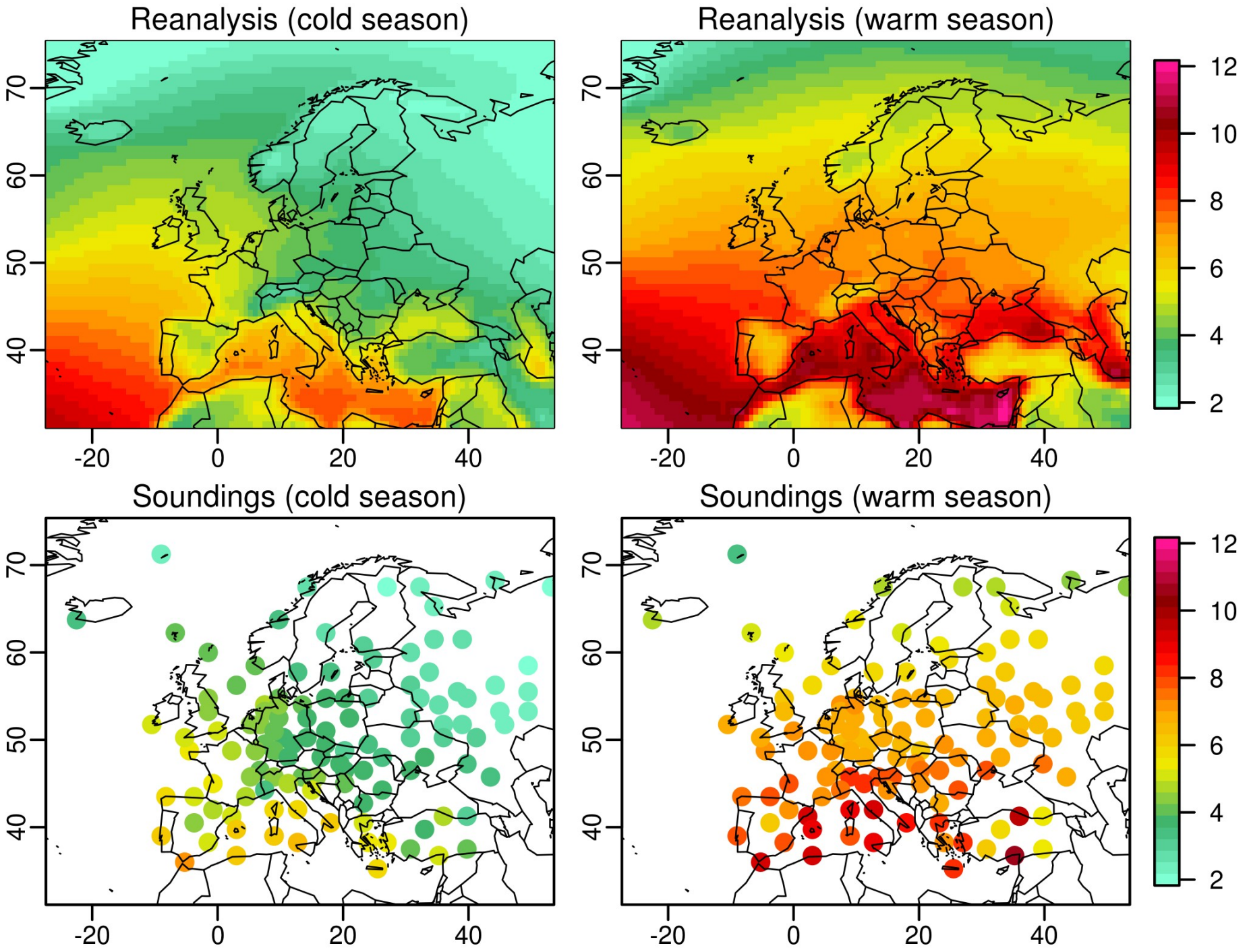
Mean MIXR [g kg^{-1}]



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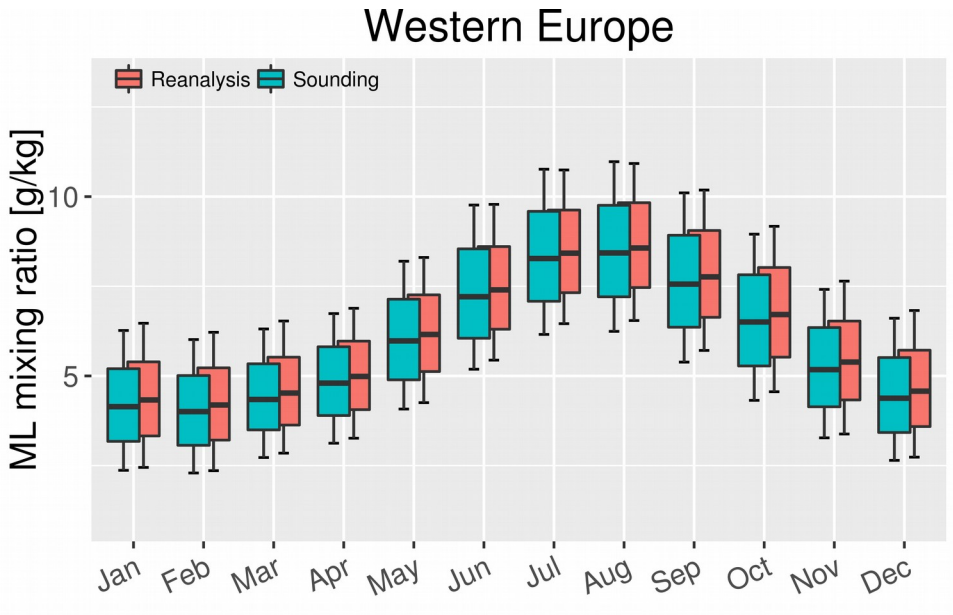
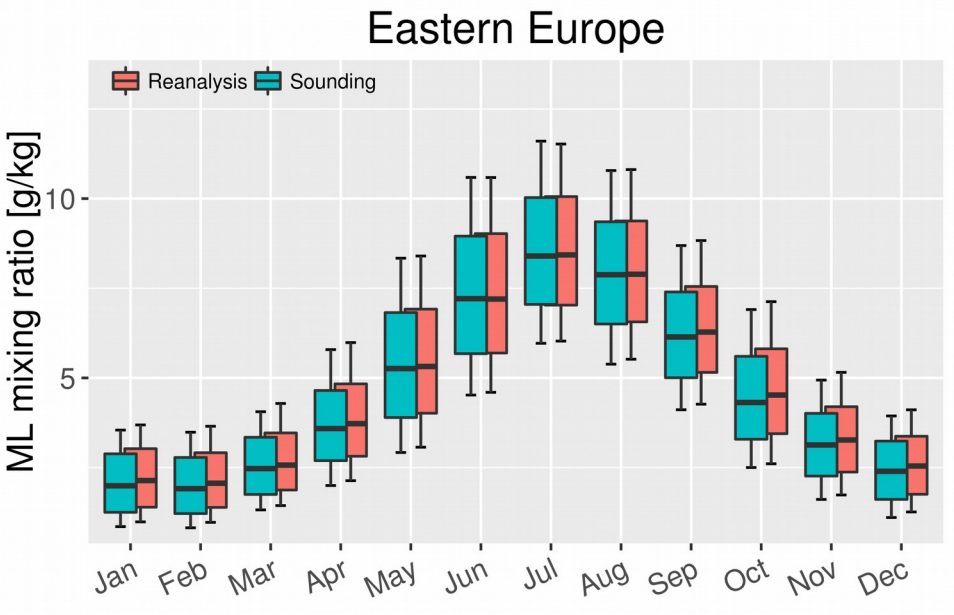
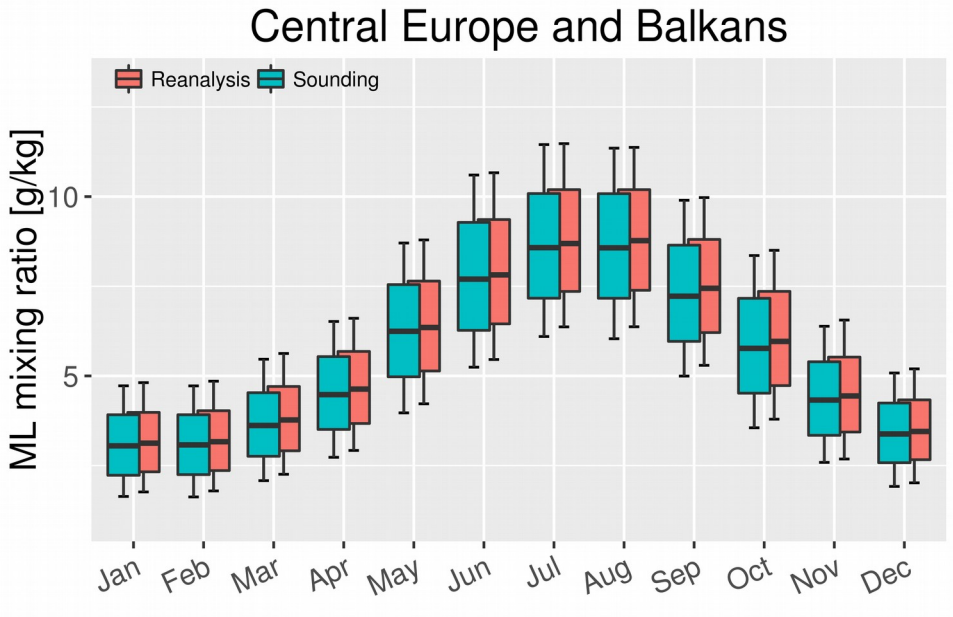
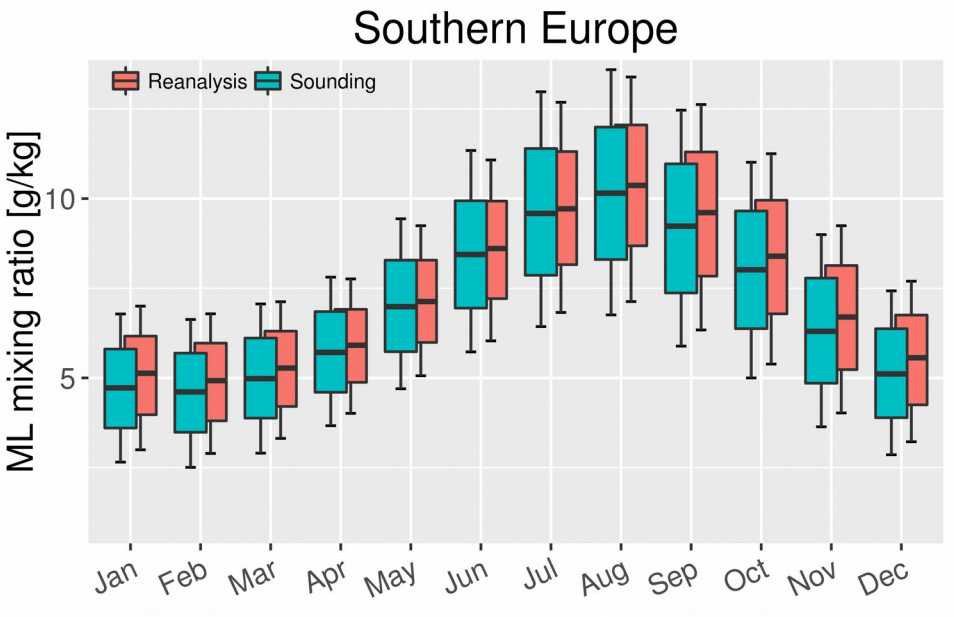
MIXR [g kg^{-1}]









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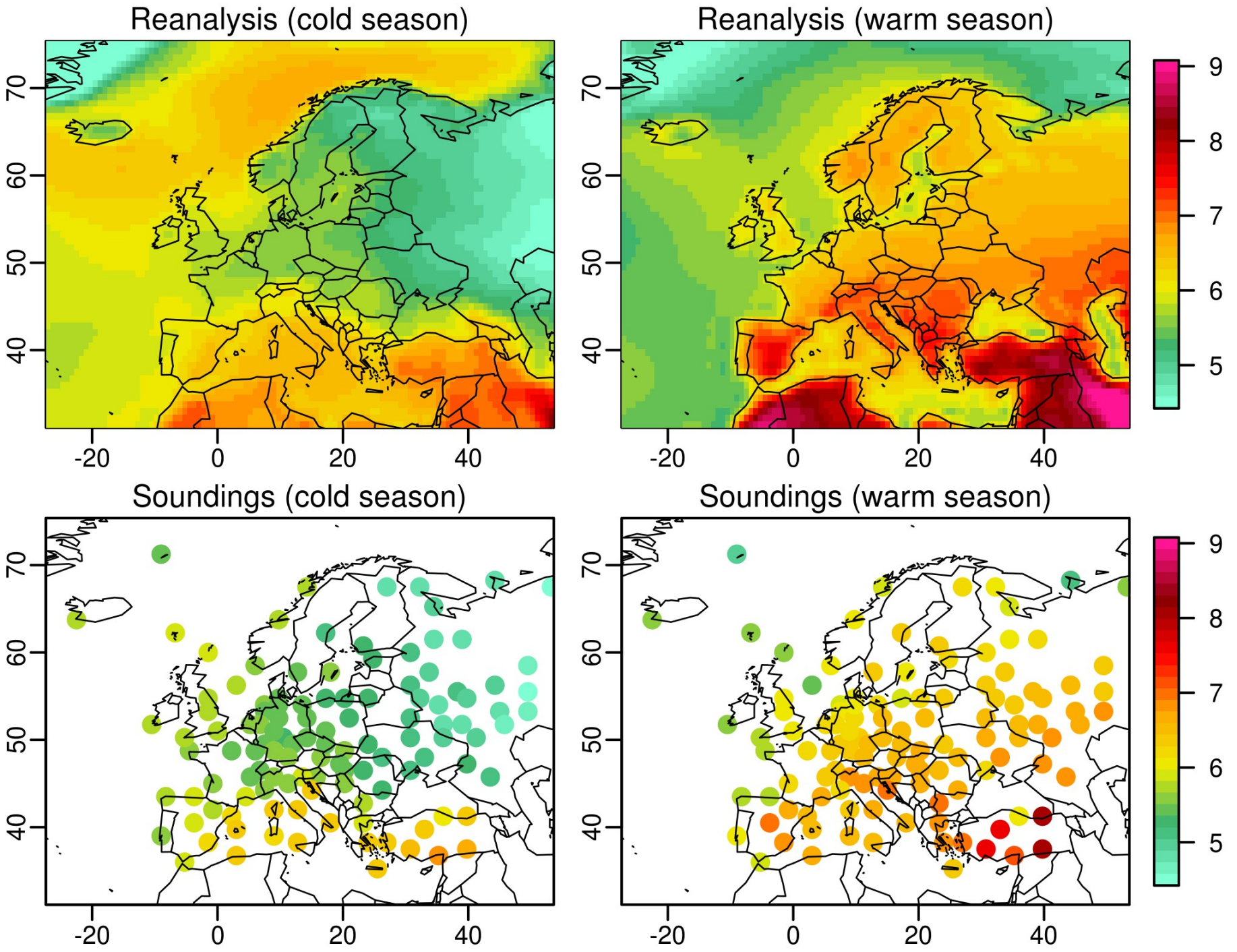
Mean LR85 [K km^{-1}]



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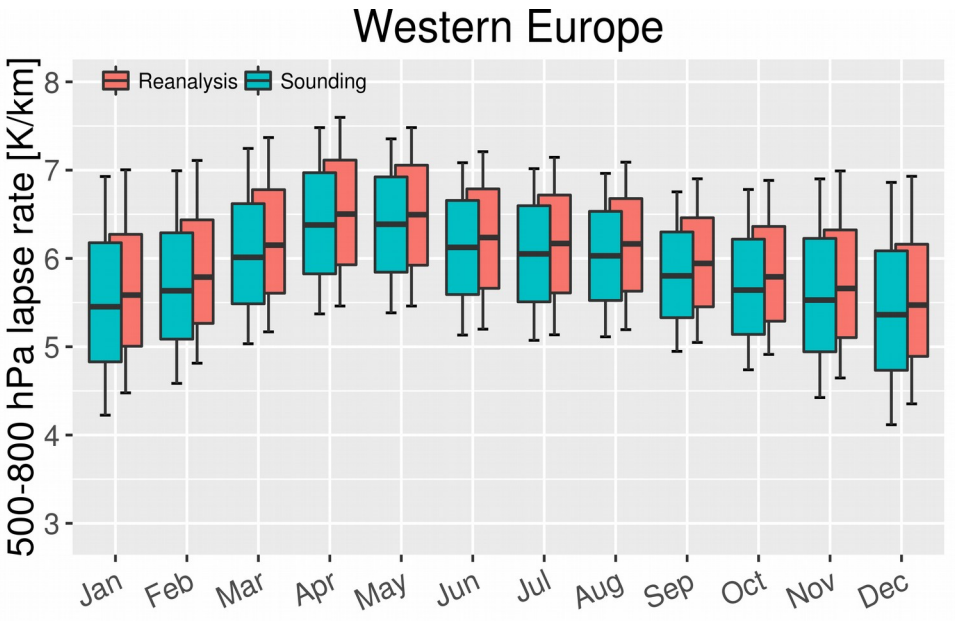
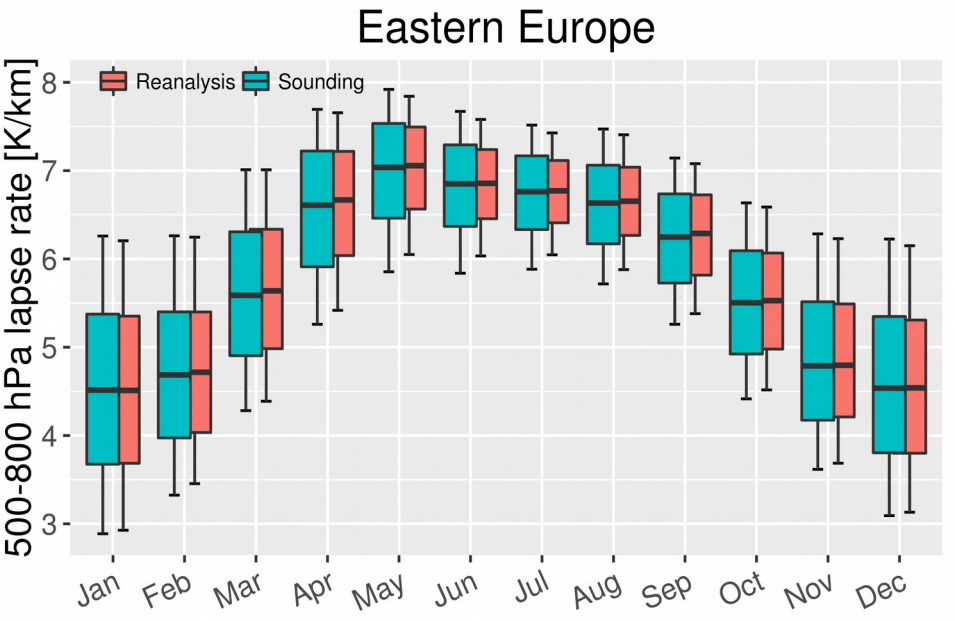
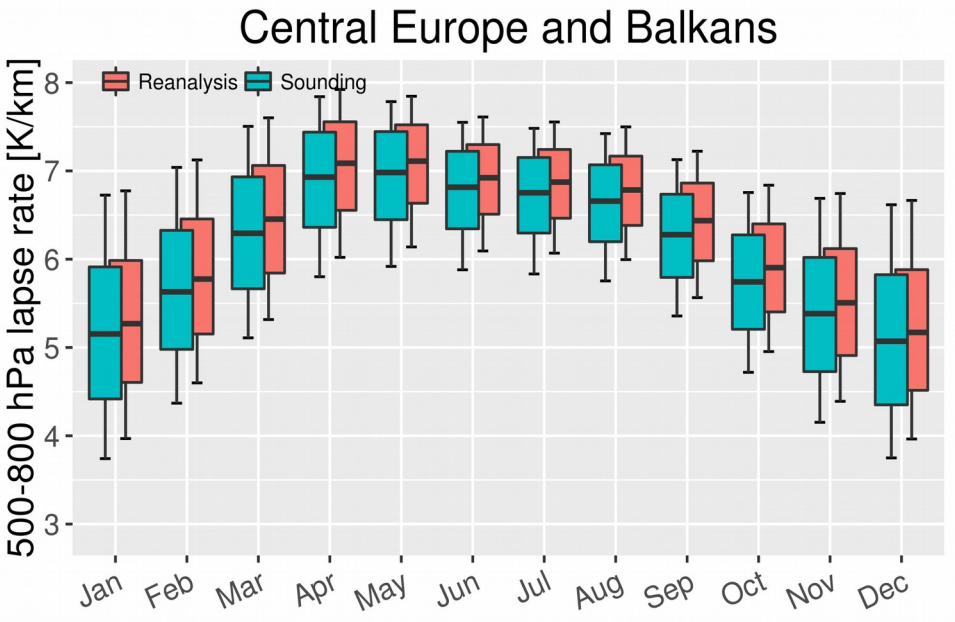
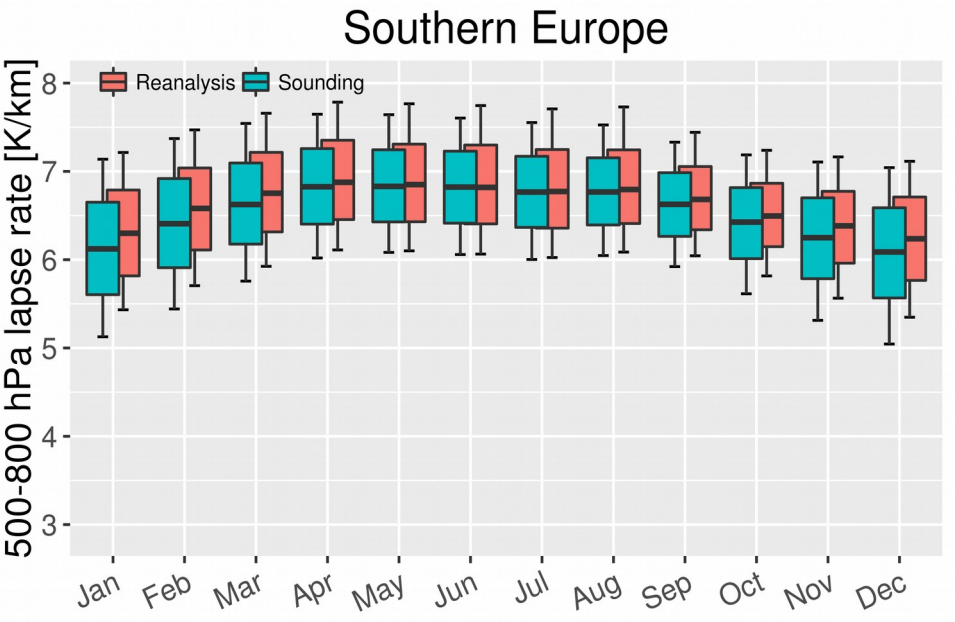
LR85 [K km^{-1}]









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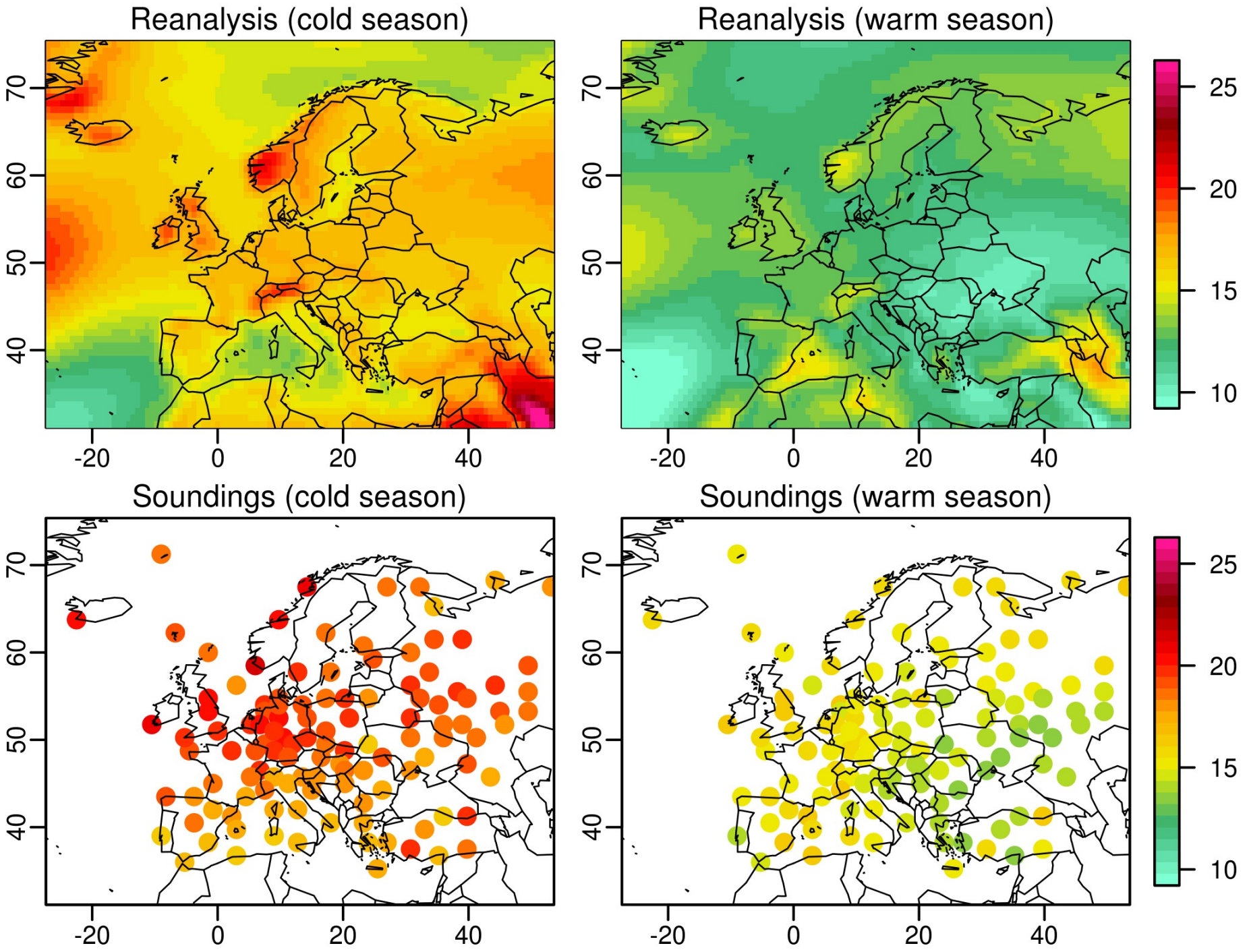
Mean DLS [m s^{-1}]



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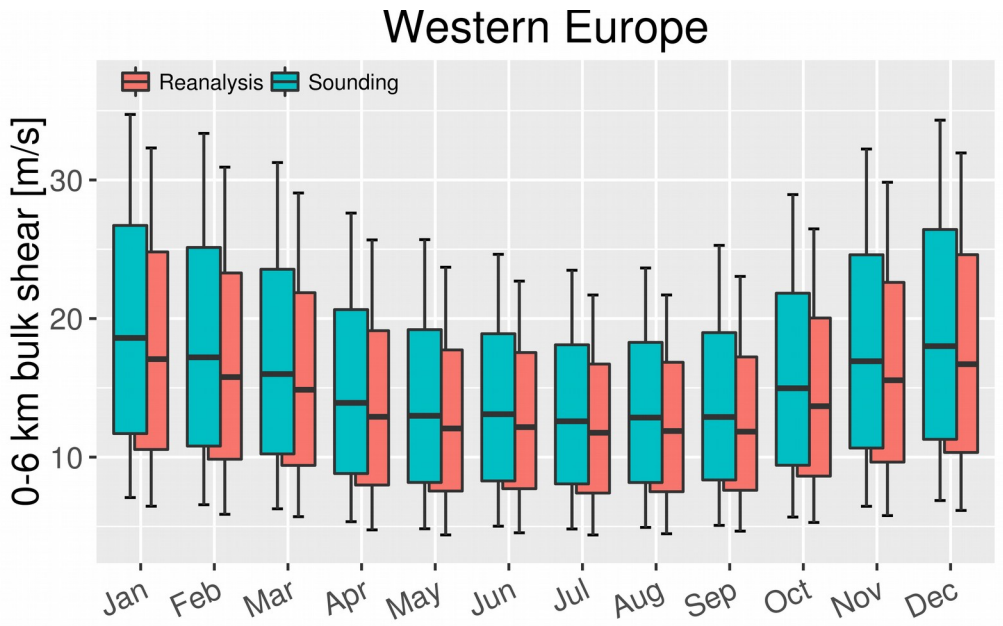
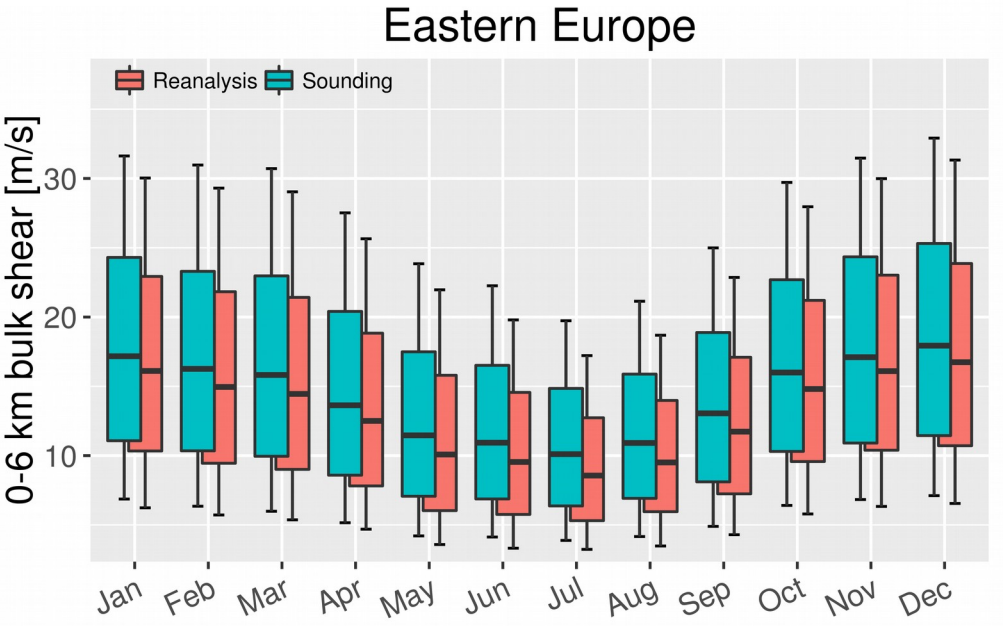
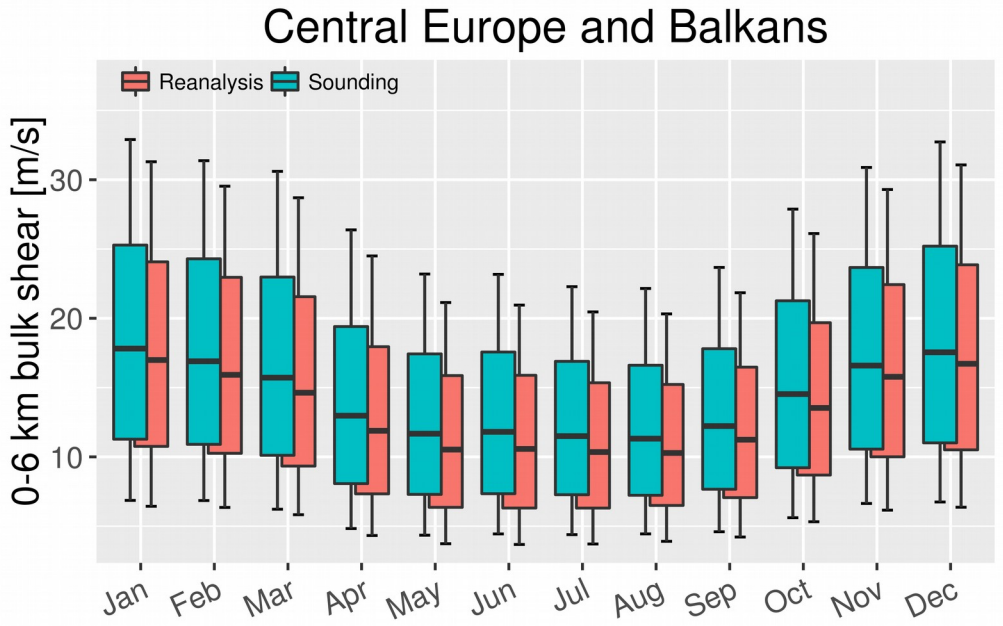
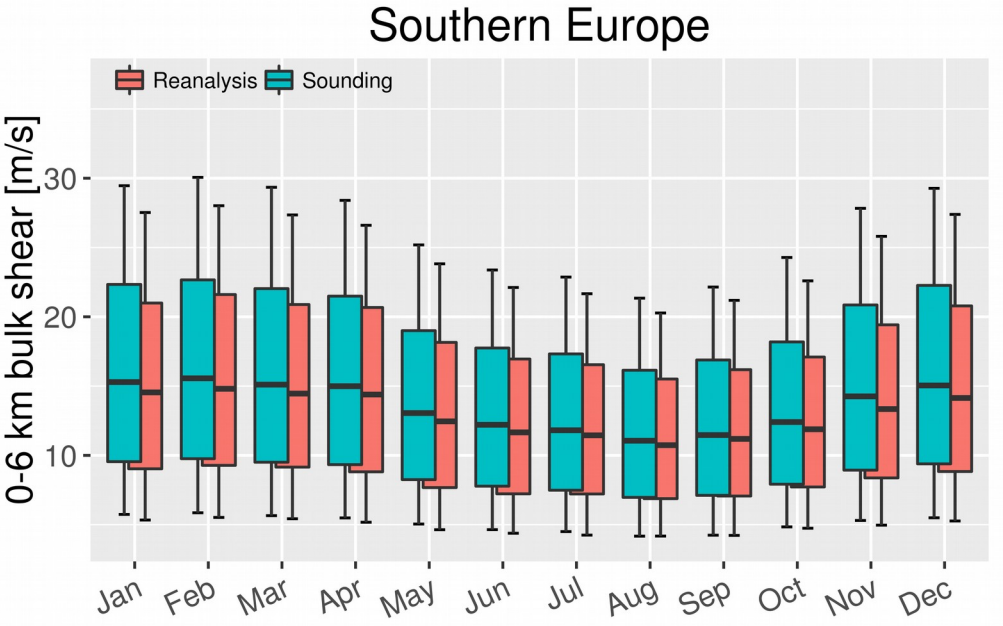
DLS [m s^{-1}]









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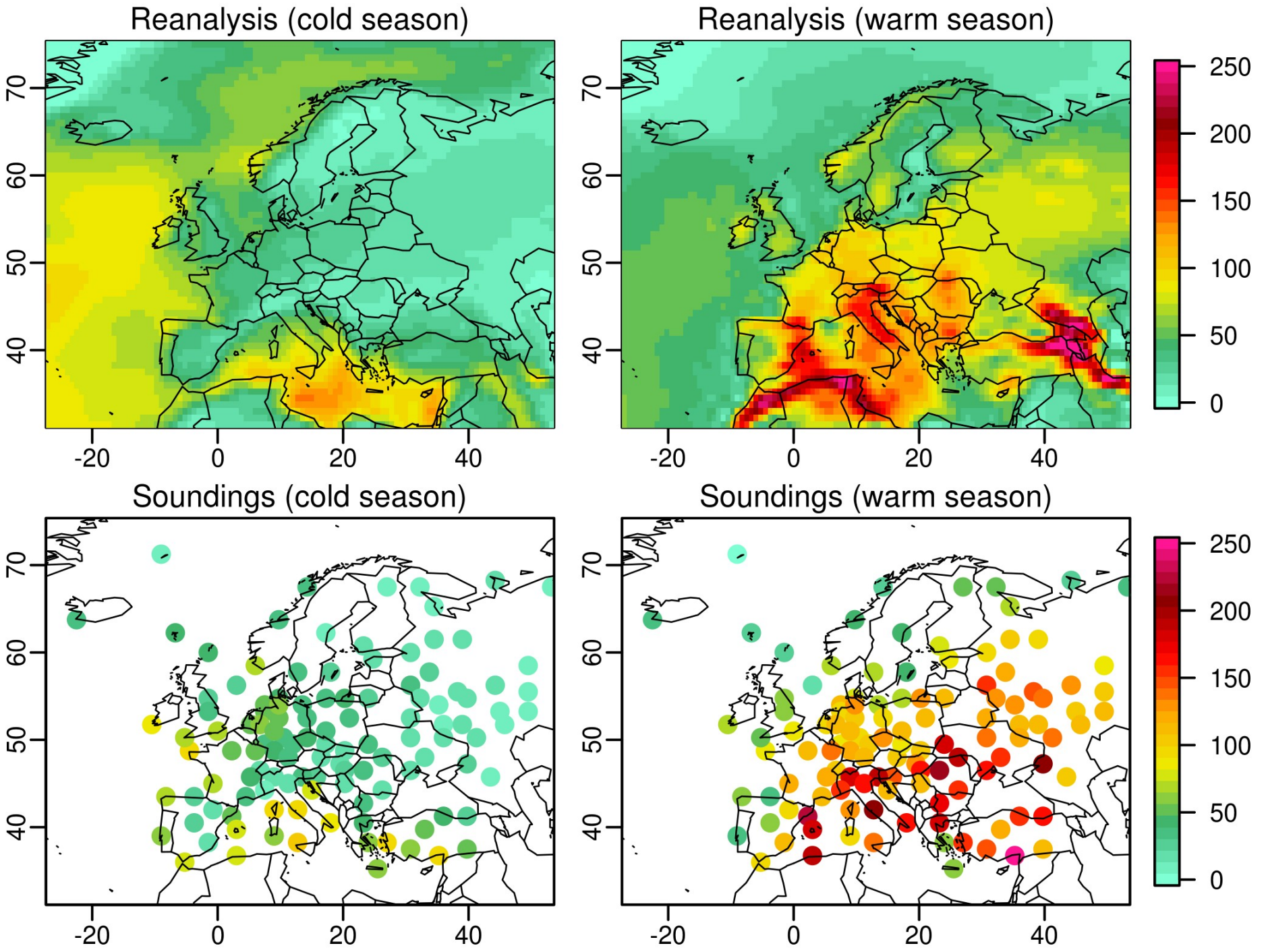
Mean ML WMAXSHEAR [$m^2\ s^{-2}$]



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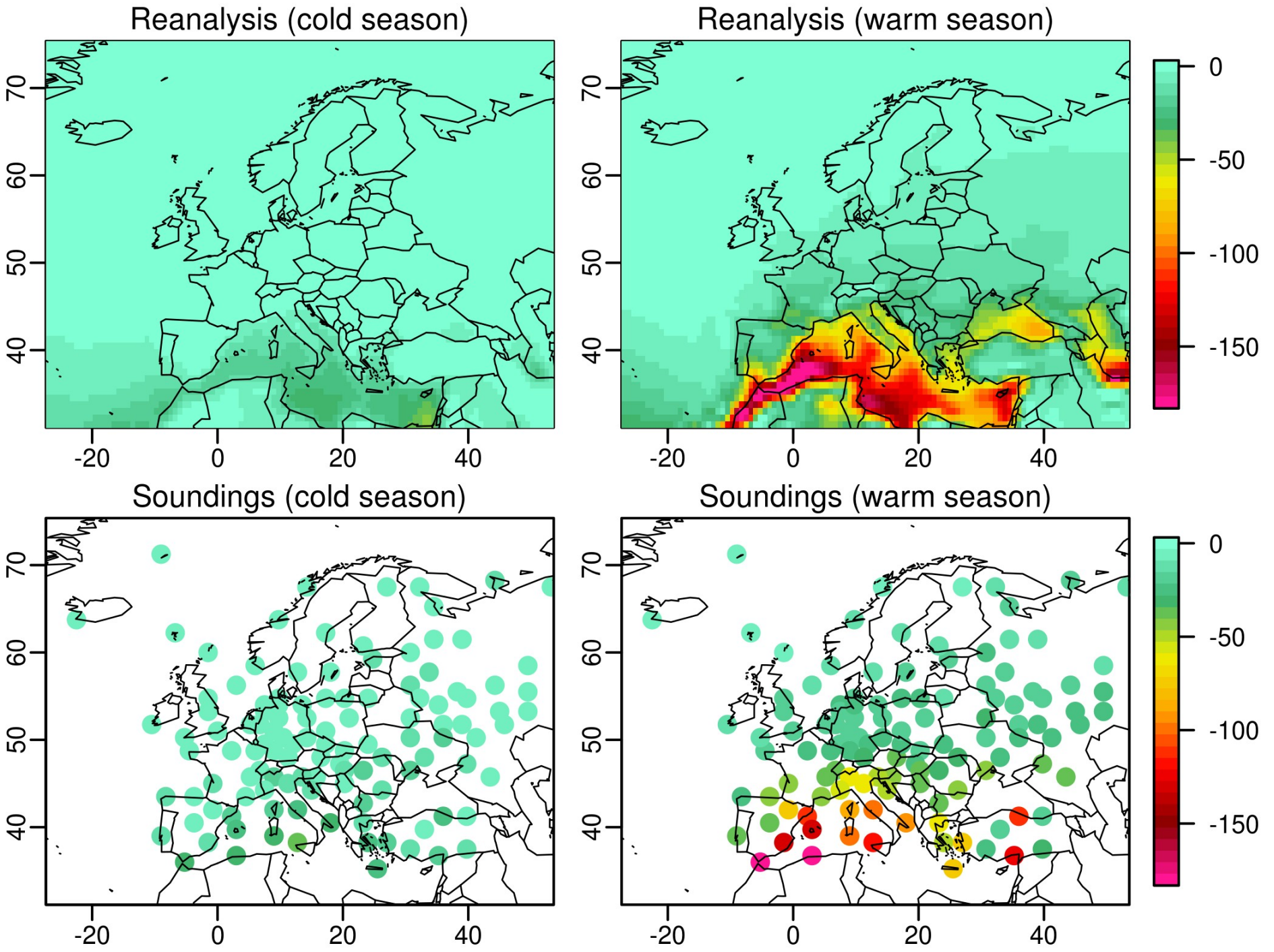
Mean ML CIN [J kg^{-1}]



… but how to provide results in a more empirical way?

Potential thunderstorm	ML CAPE > 100 J kg^{-1}
	ML CIN > -50 J kg^{-1}
Potential severe thunderstorm	ML CAPE > 100 J kg^{-1}
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Kaltenböck et al. (2009), Sander (2010), Gensini and Ashley (2011), Westermayer et al. (2016), Diffenbaugh et al. (2013), Pucik et al. (2015), Kolendowicz et al. (2017), Taszarek et al. (2017)

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Potential th

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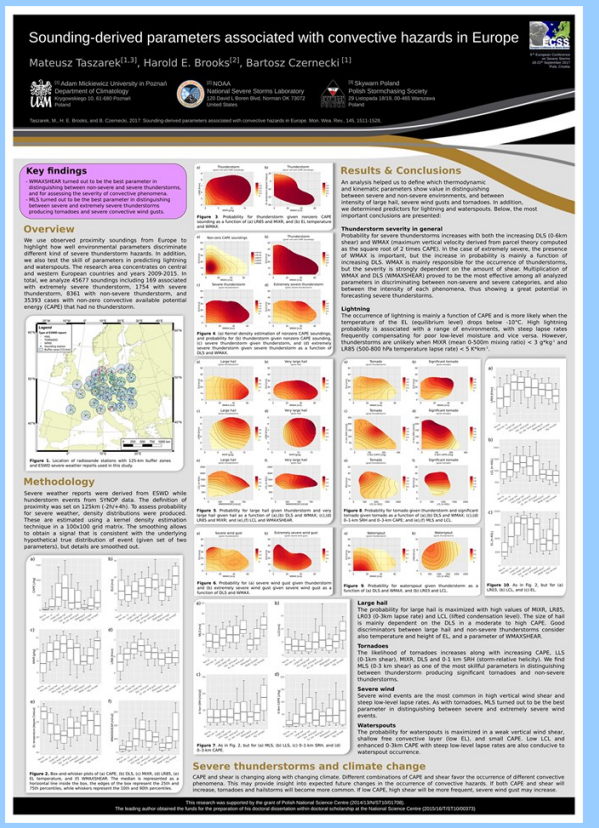
$m^2\ s^{-2}$

Poster P57
Session 2
(Thursday)



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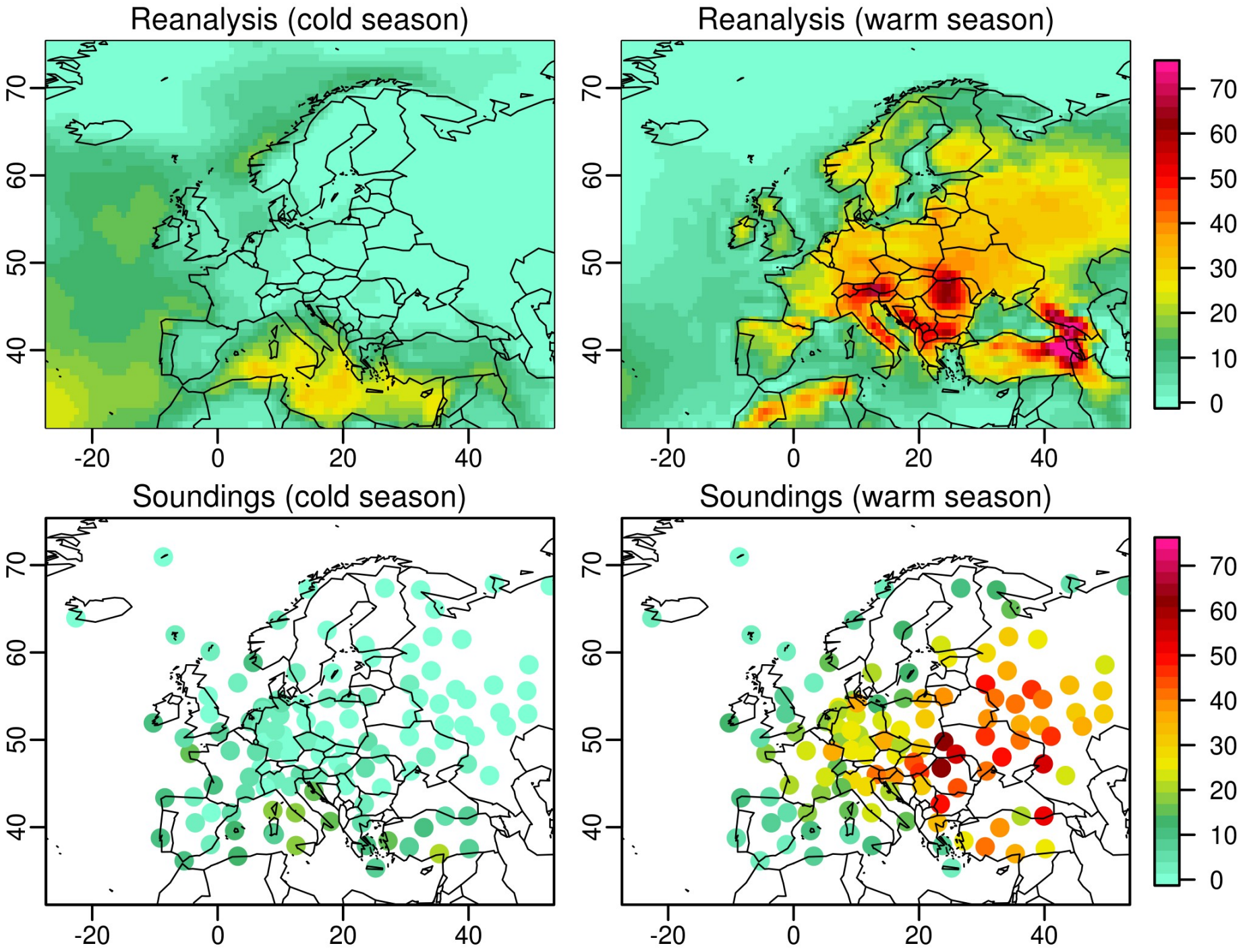
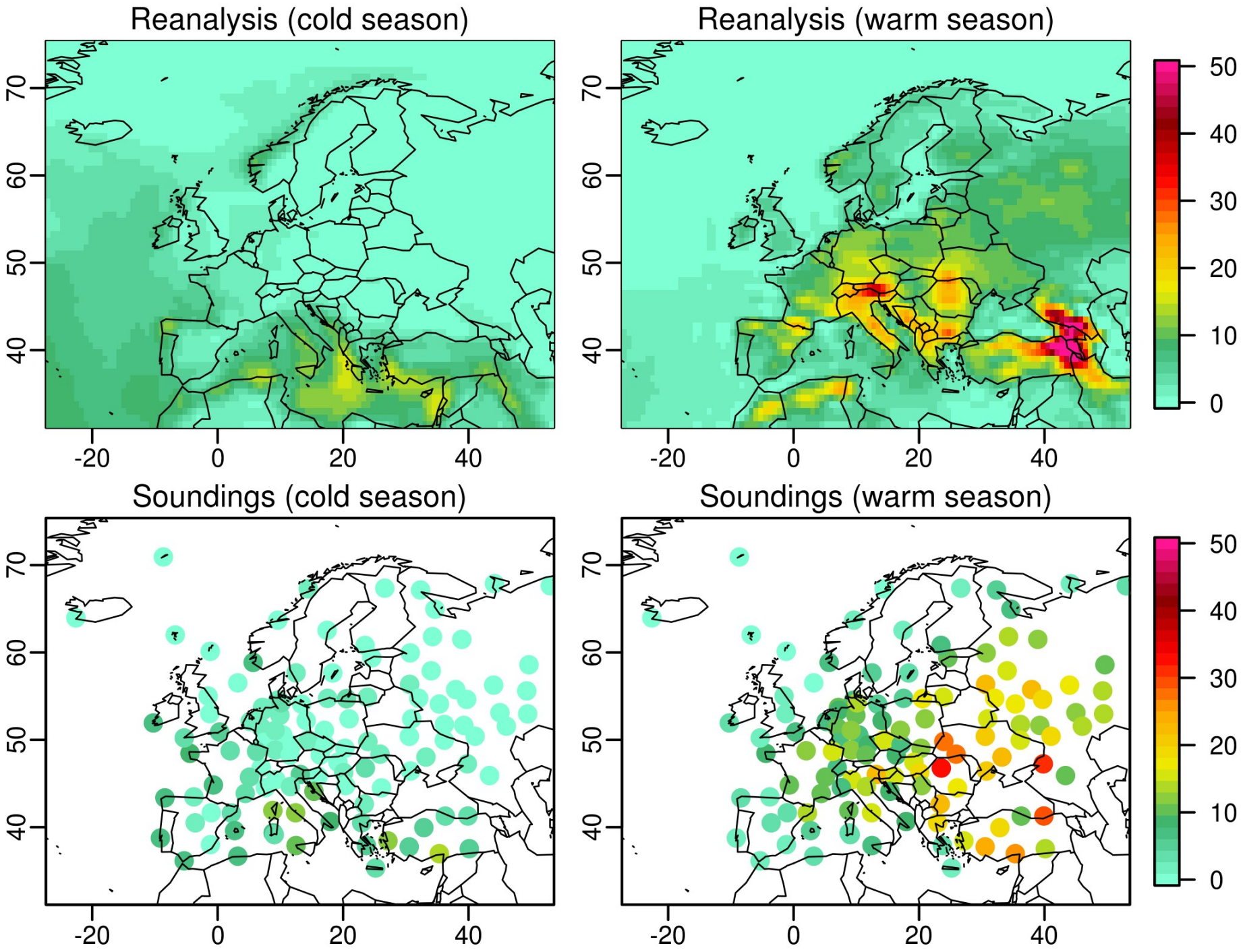
Mean annual number of days with potential thunderstorm



Mean annual number of days with potential severe thunderstorm



Summary

1. How well reanalysis estimate real convective environment?

2. What is the annual cycle and spatial distribution of ingredients for deep moist convection in Europe?

3. Which areas in Europe are the most prone to (severe) thunderstorms?

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Submitted to Journal of Climate

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Questions?

mateusz.taszarek@amu.edu.pl
www.enwo.pl

Derecho in W Poland (near Krotoszyn), photography: author (11.08.2017)

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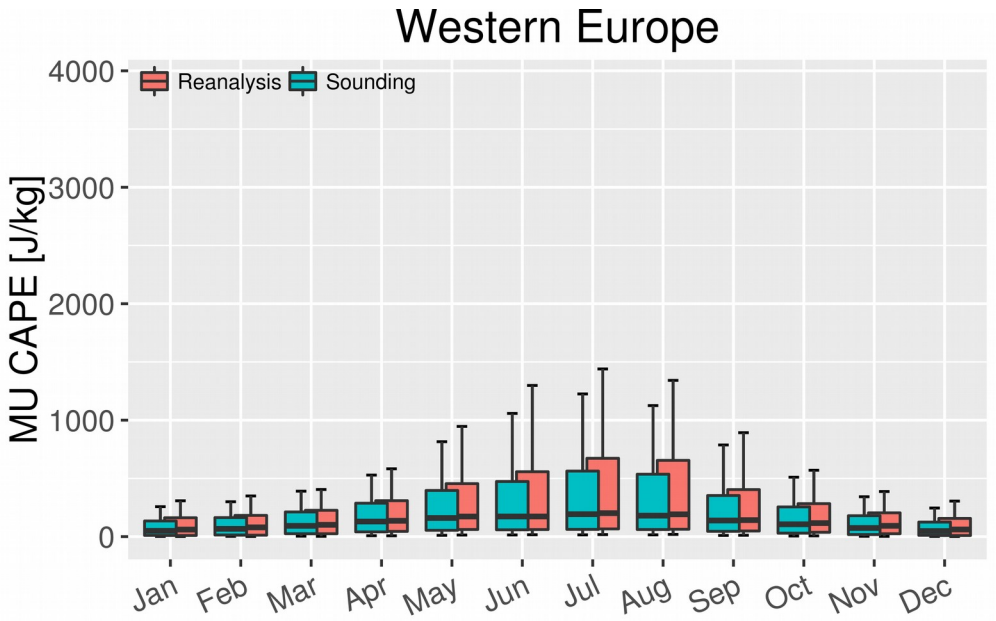
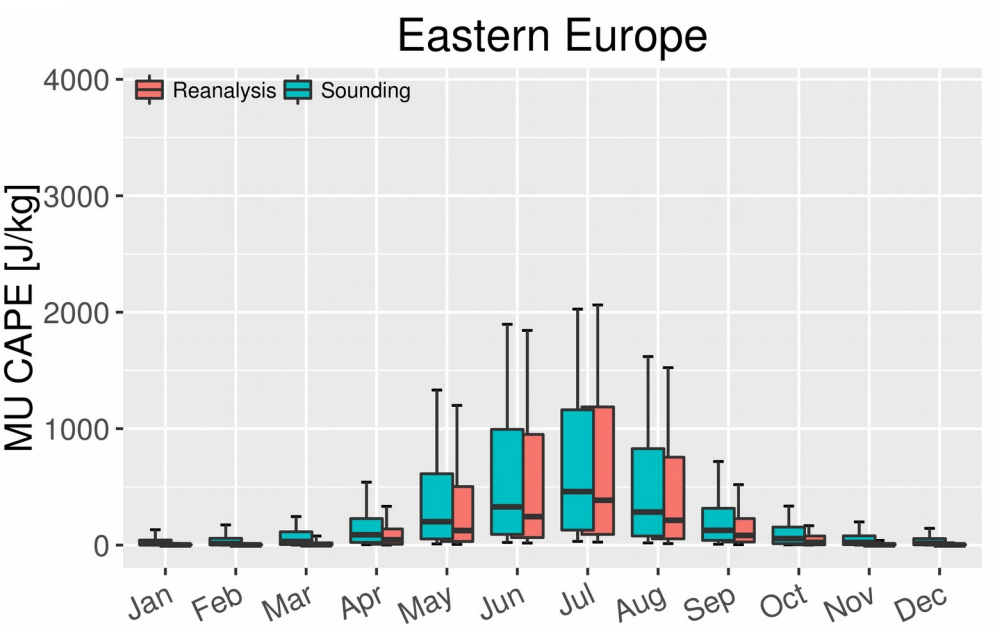
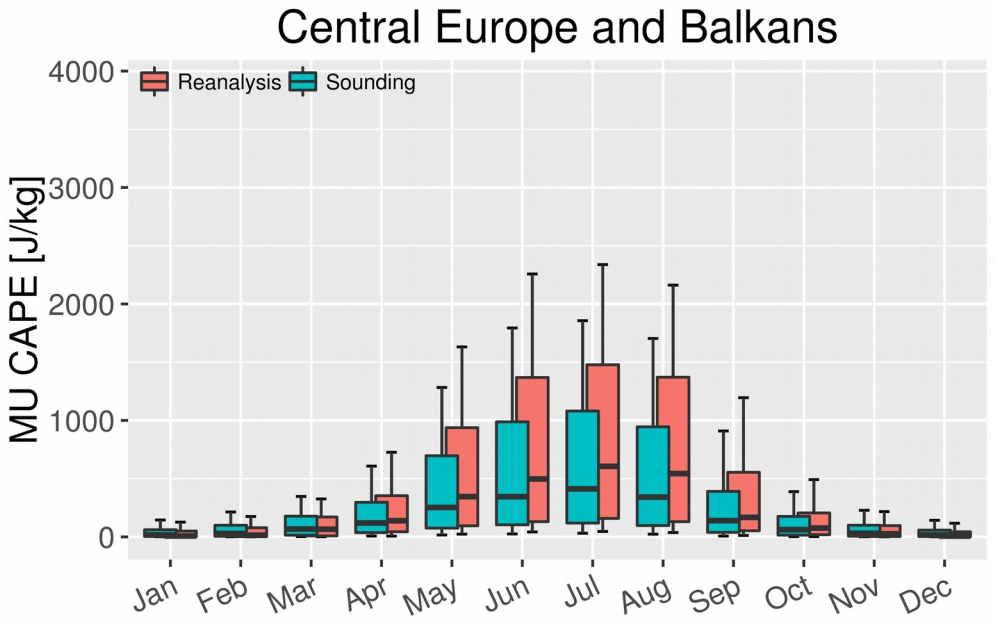
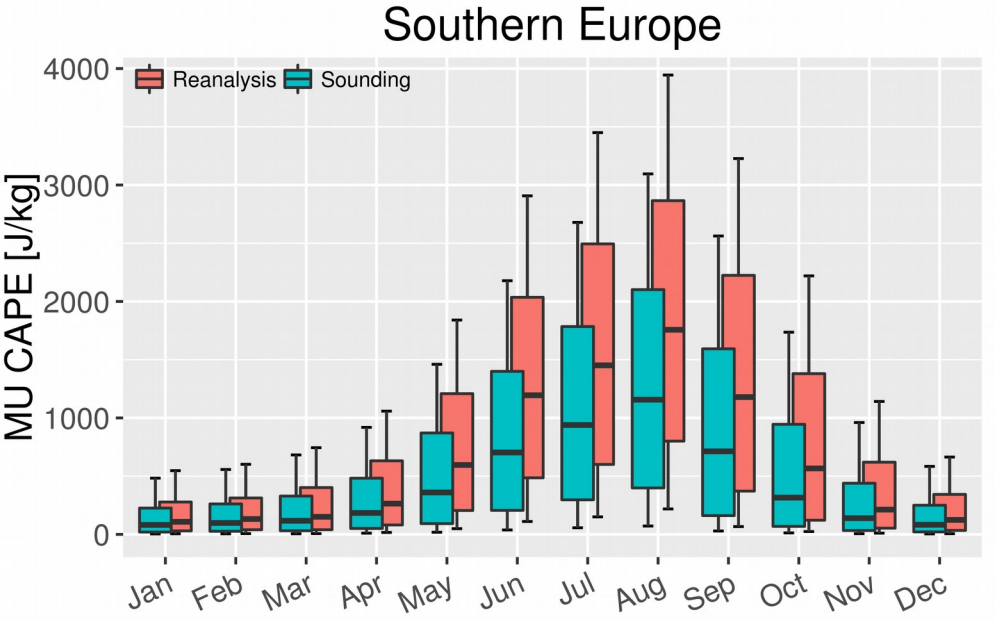
MU CAPE [J kg^{-1}]









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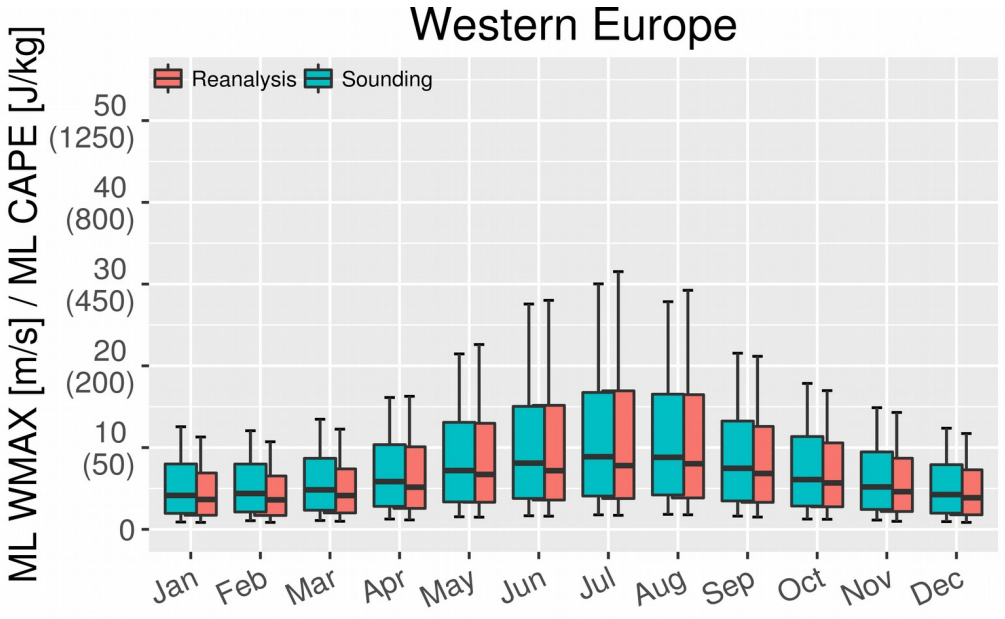
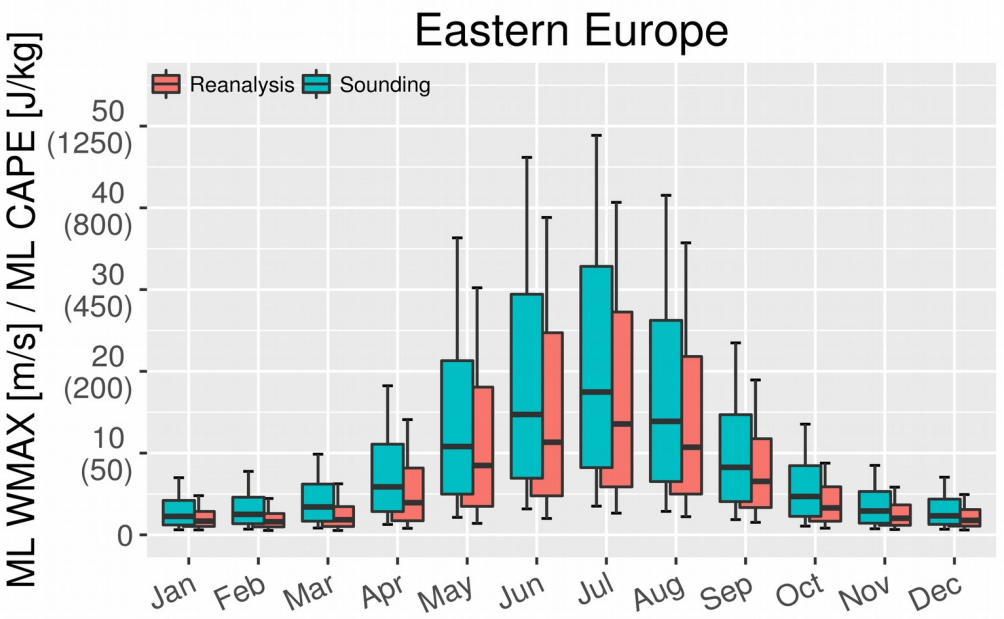
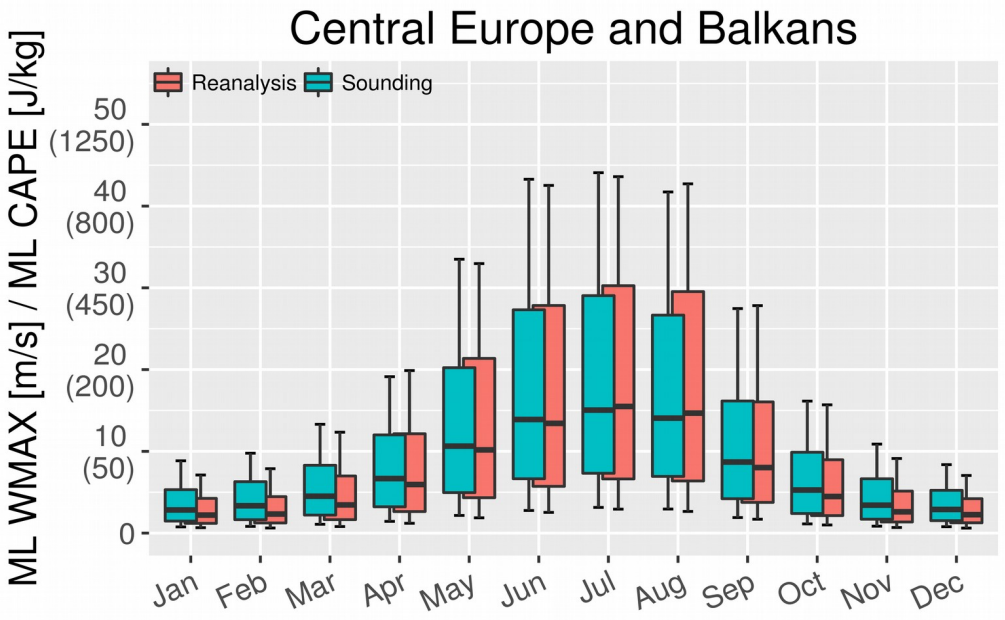
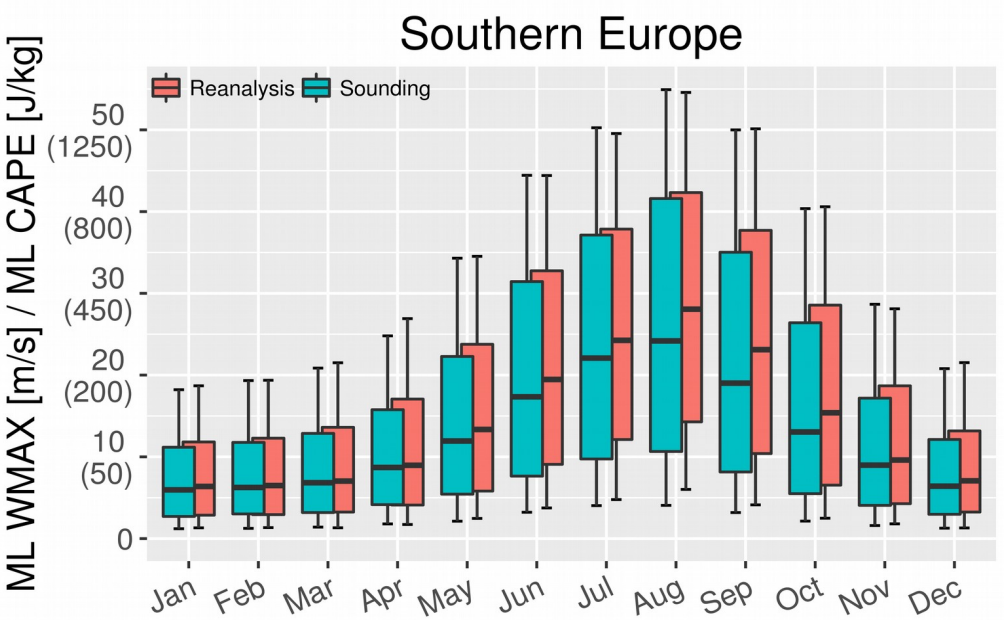
ML CAPE [J kg^{-1}]









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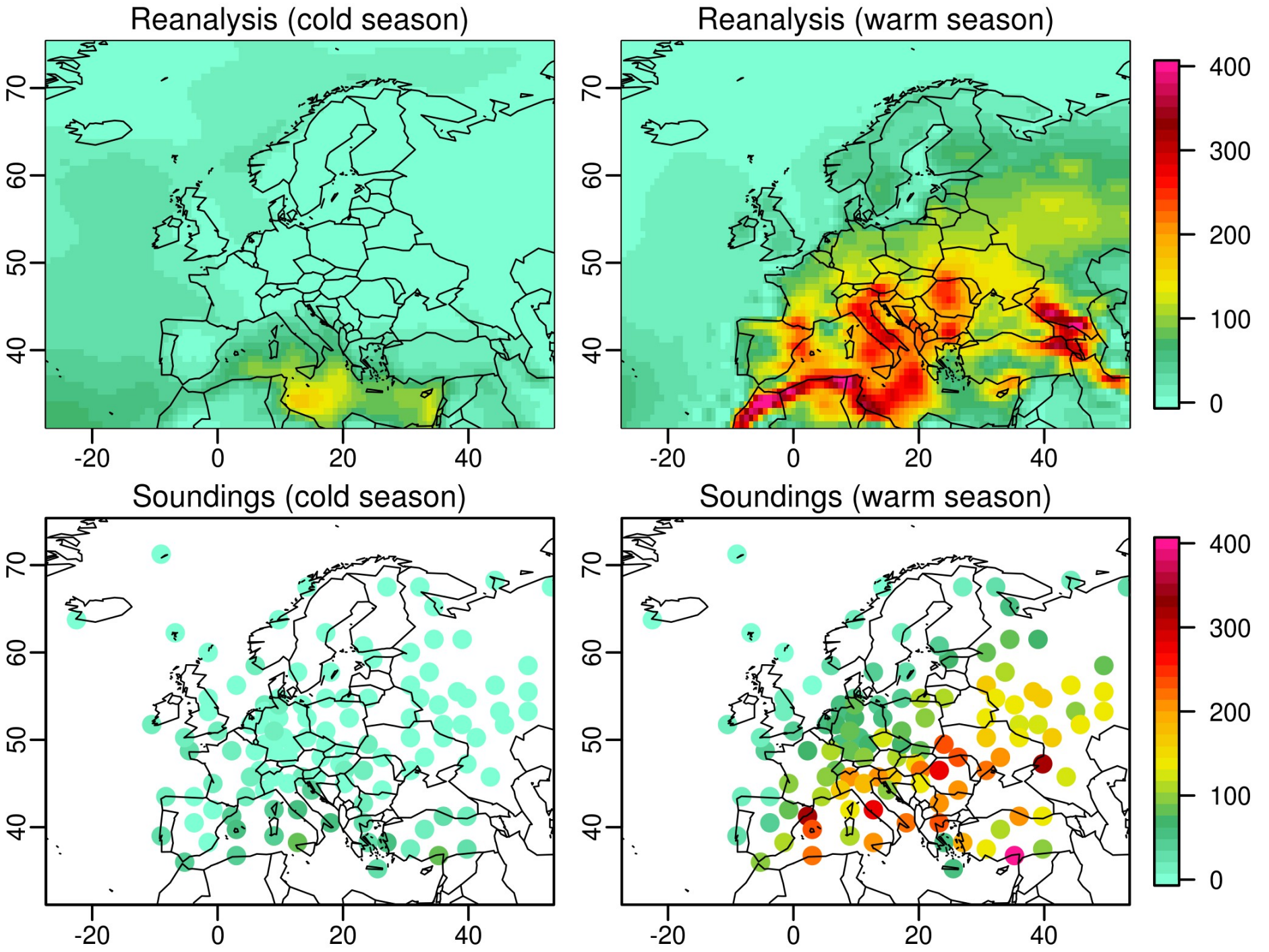
Mean ML CAPE [J kg^{-1}]



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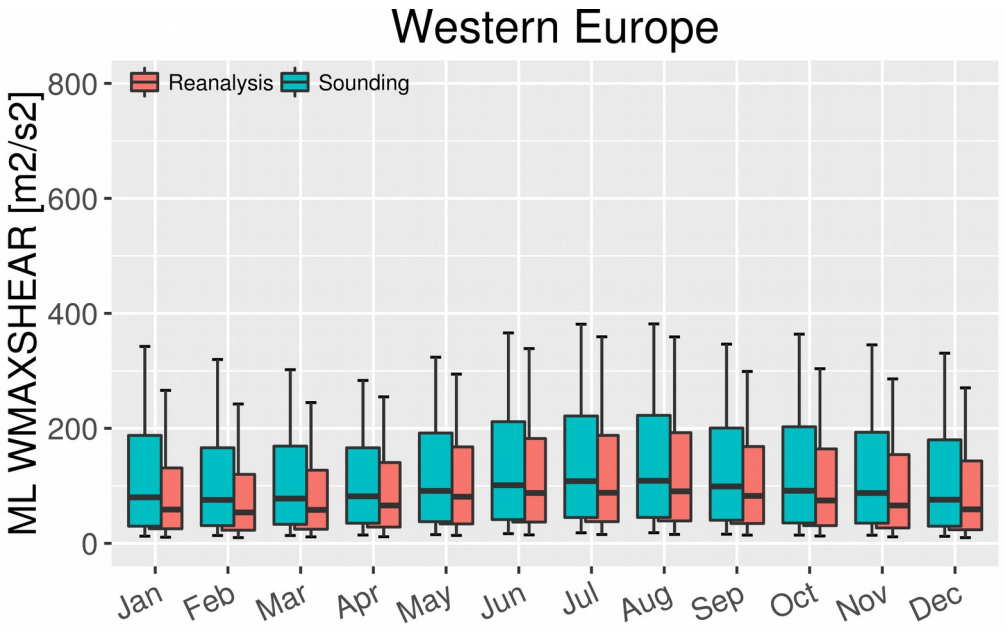
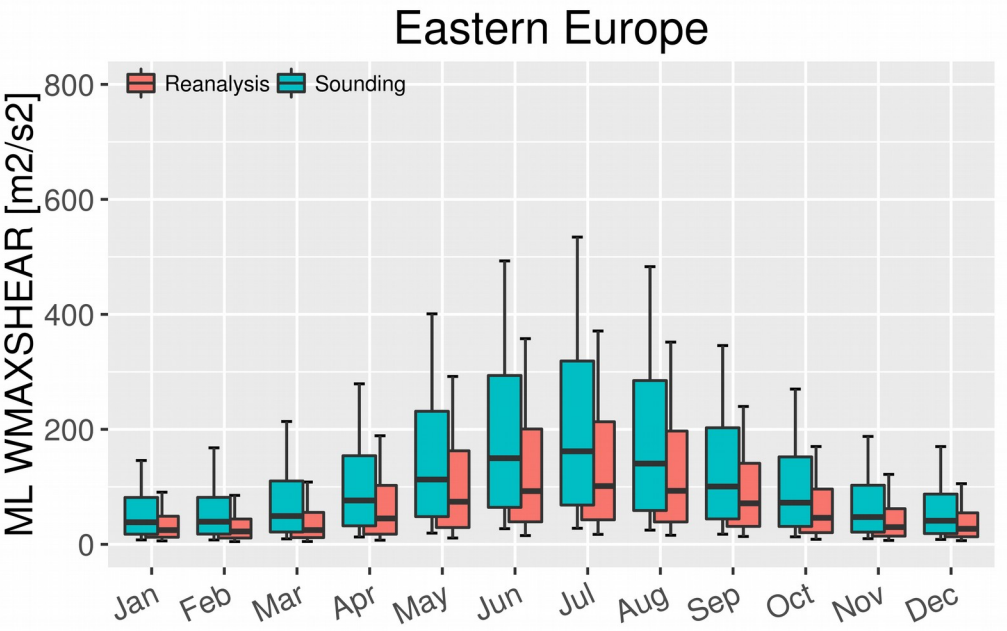
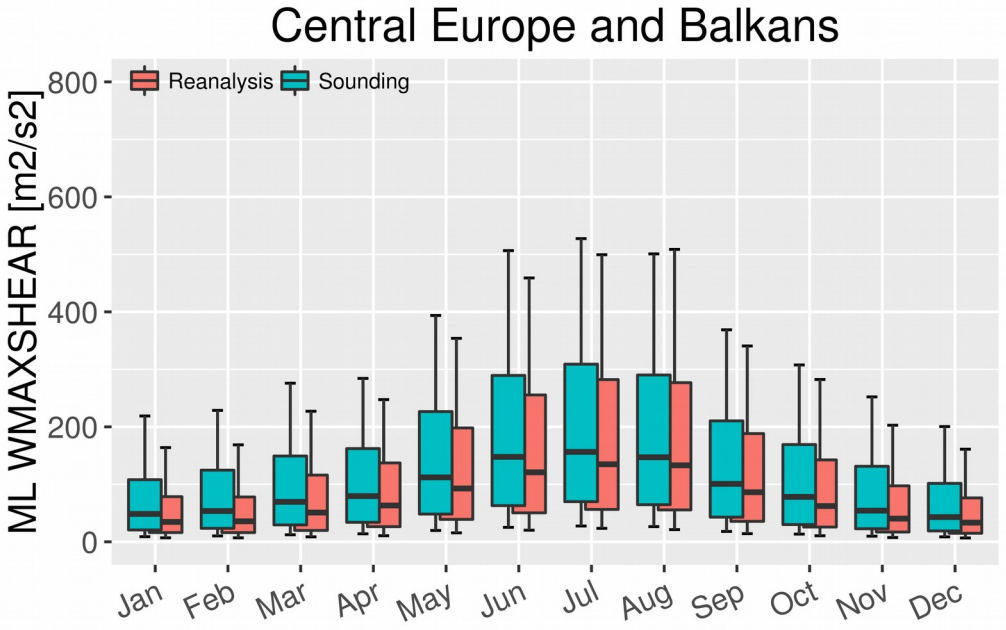
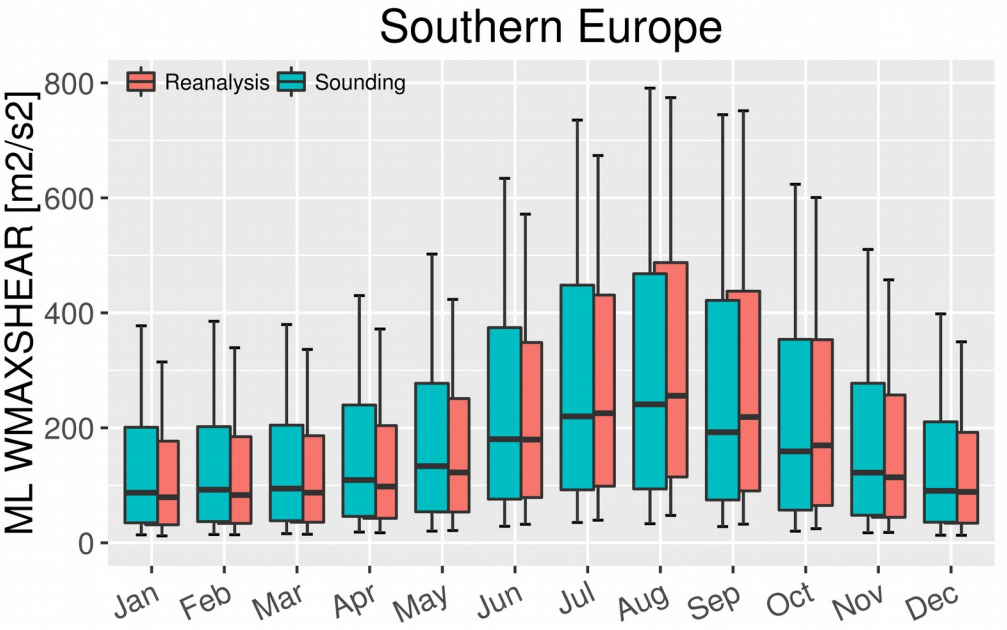
ML WMAXSHEAR [m^2 s^{-2}]

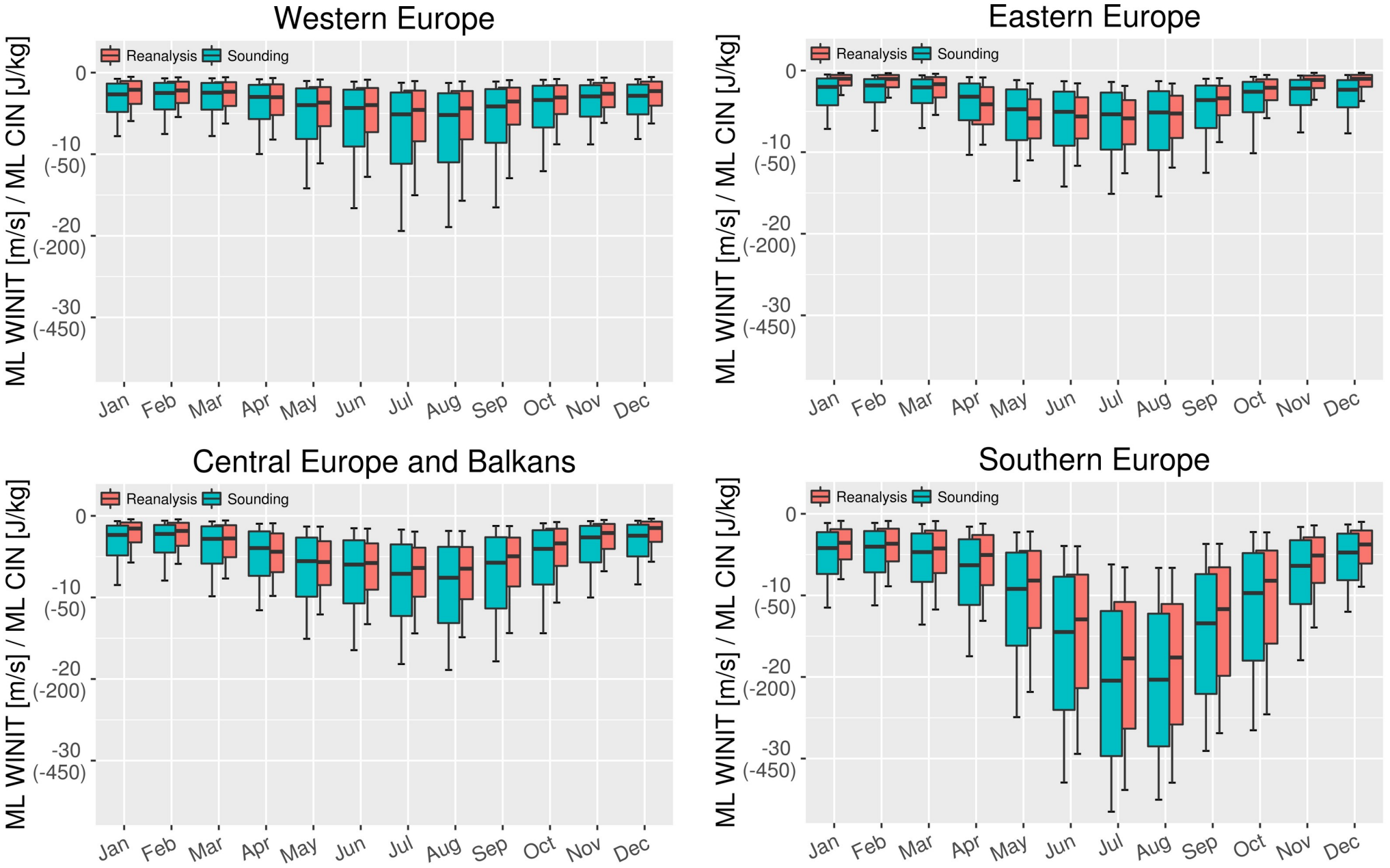




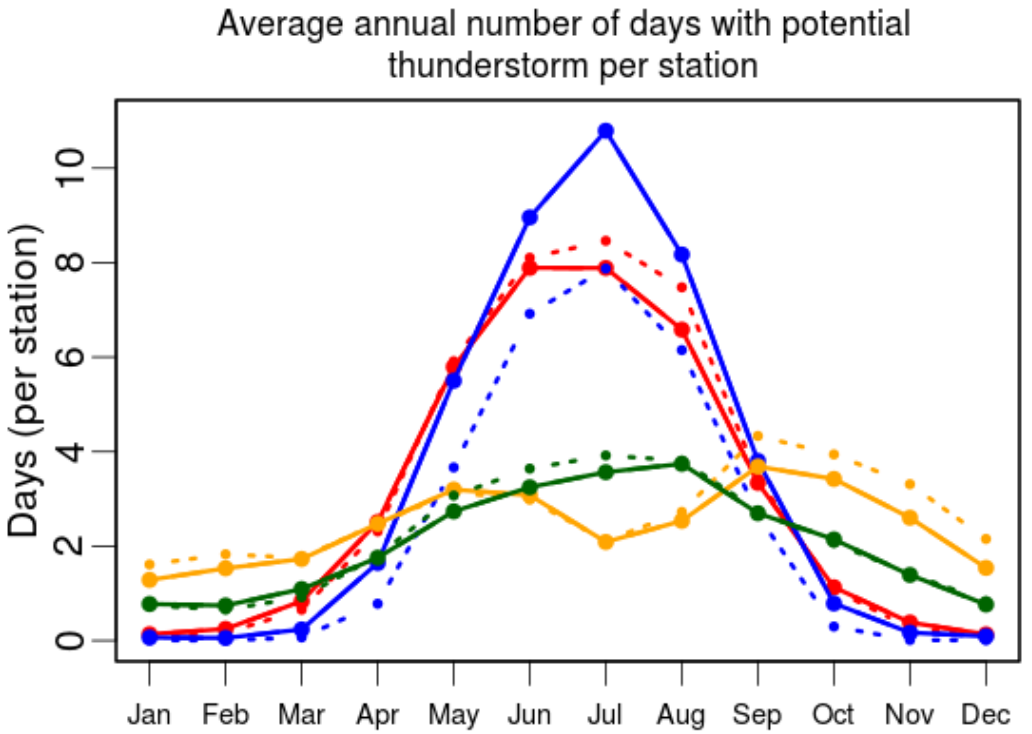


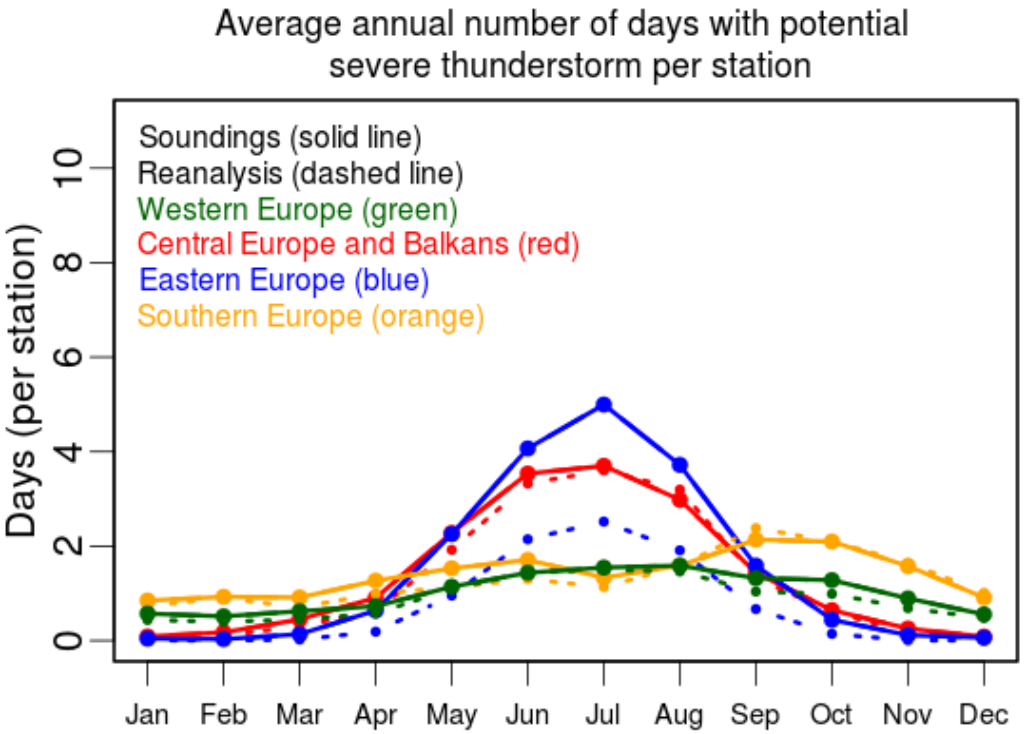


ML CIN [J kg^{-1}]


Western Europe
Eastern Europe
Central Europe and Balkans
Southern Europe
Reanalysis
Sounding
ML WINIT [m/s] / ML CIN [J/kg]
0
-10
(-50)
-20
(-200)
-30
(-450)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Annual cycle





Central Europe and Balkans