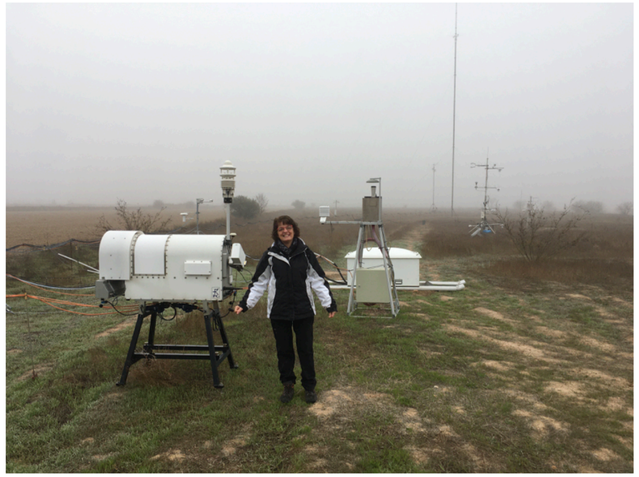
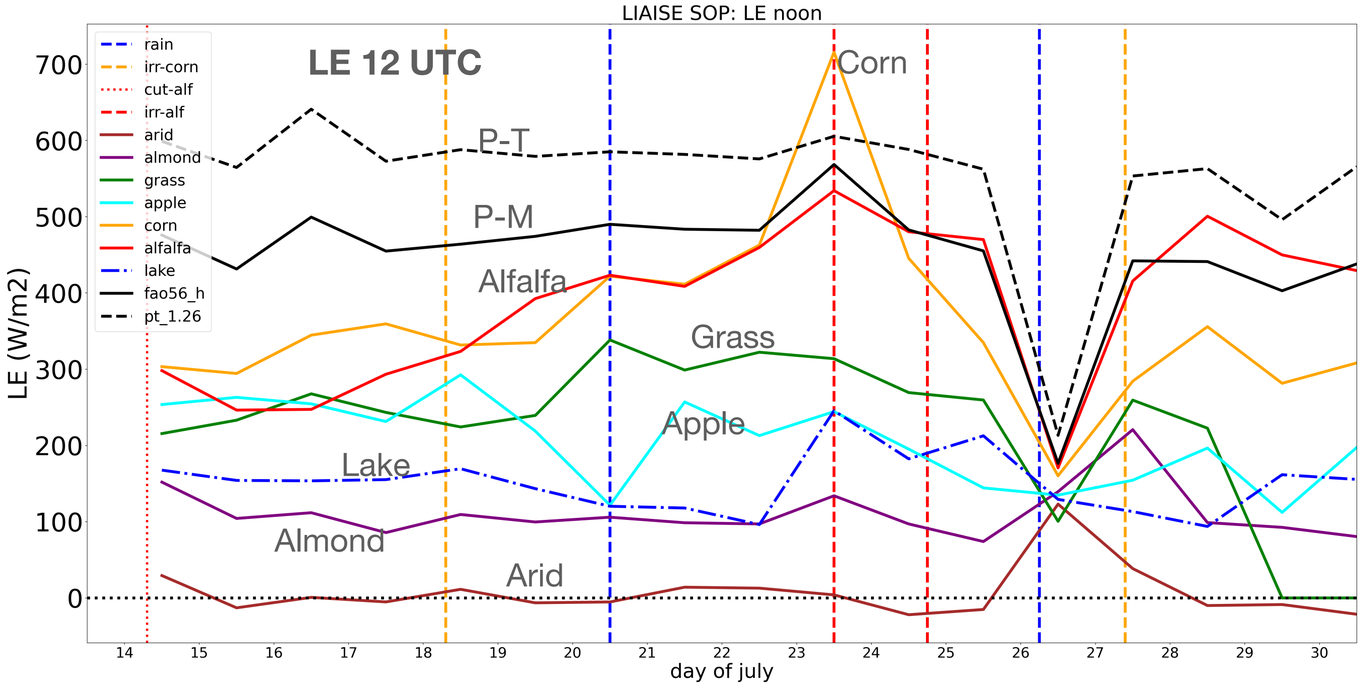
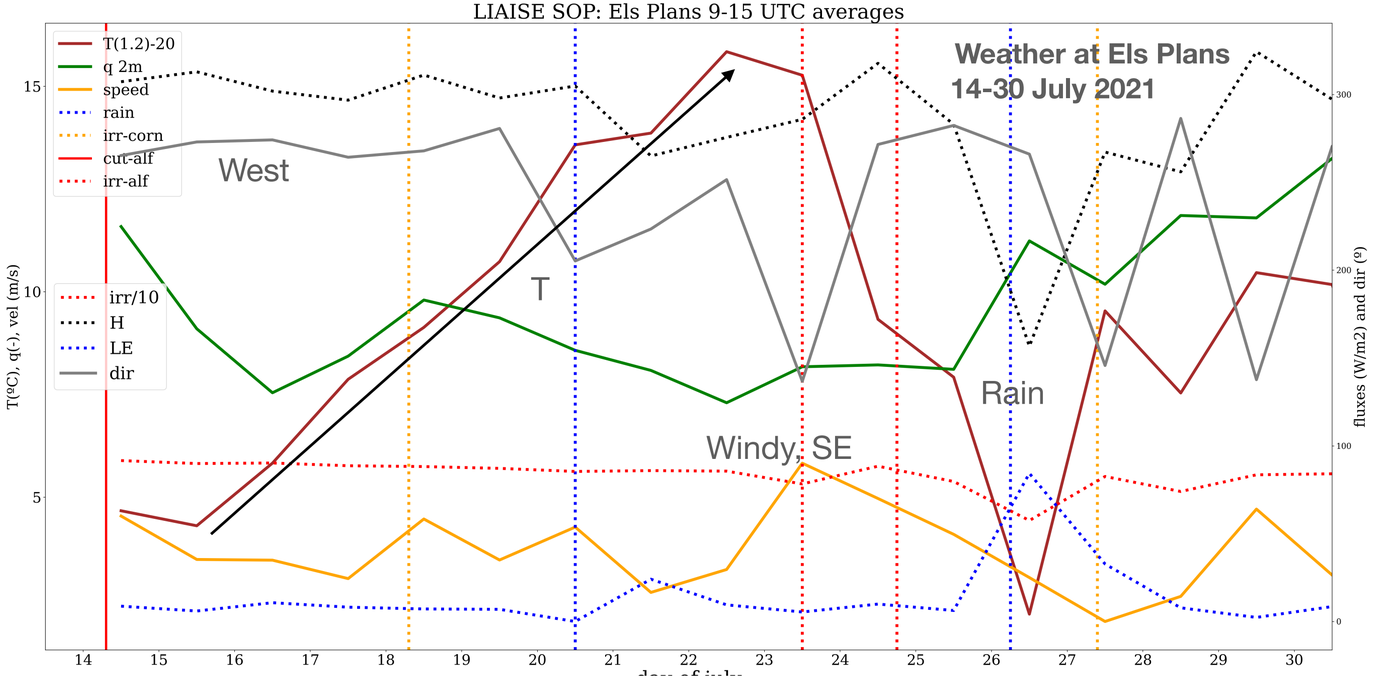
ET: spatial variability of EC values depending on the state of the surface

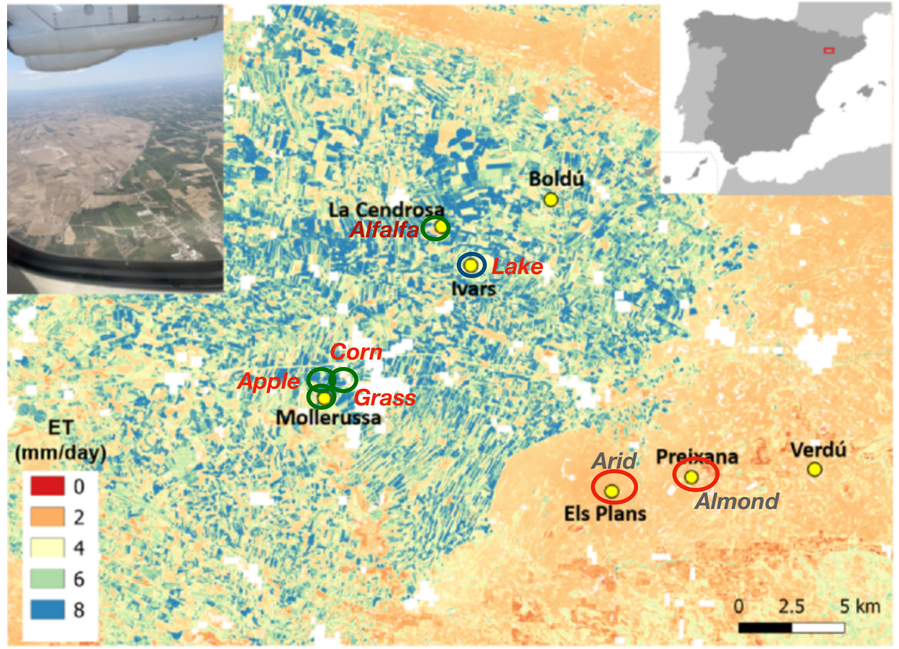
J. Cuxart[1], D. Martínez-Villagrasa[1], B. Martí[1,2], A. Rouchon[1,2], A. Boone[2], P. Le Moigne[2], G. Canut[2], J. Price[3], J.R. Miró[4], J. Groh[5,6,7], J. Bellvert[8].

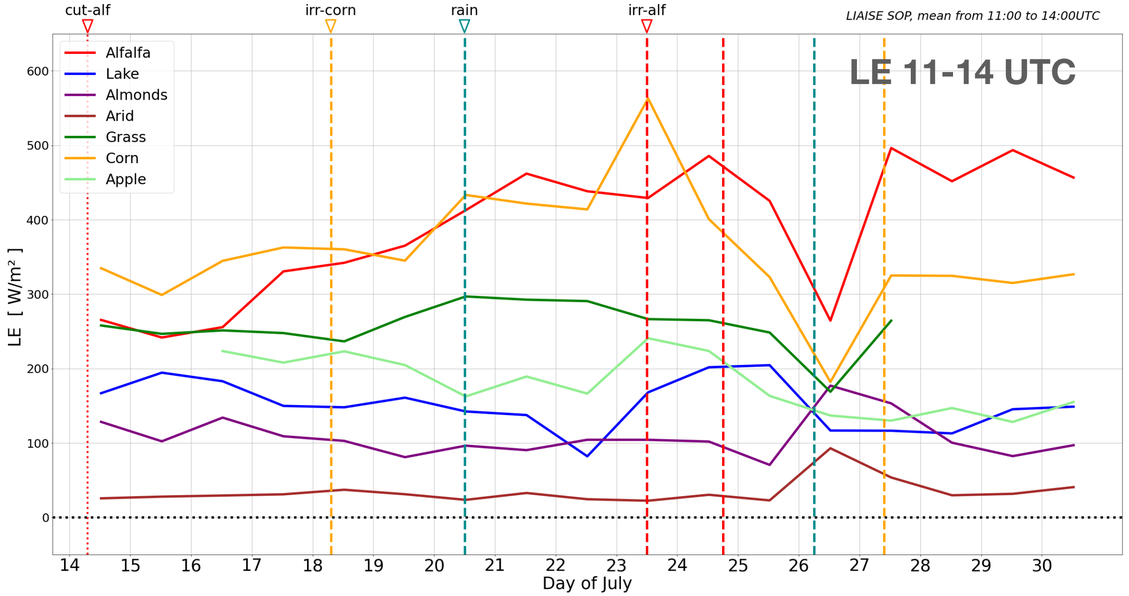
1. University of the Balearic Islands, Palma, Spain
2. Centre National de Recherches Météorologiques, Toulouse, France
3. Met Office, Cardington, UK
4. Meteorological Service of Catalonia, Barcelona, Spain
5. Soil Science and Soil Ecology Lab - INRES, University of Bonn, Germany
6. Agrosphere Institute (IBG-3), Forschungszentrum Jülich GmbH, Germany
7. Leibniz Centre for Agricultural Landscape Research (ZALF), Germany
8. IRTA, Lleida, Spain

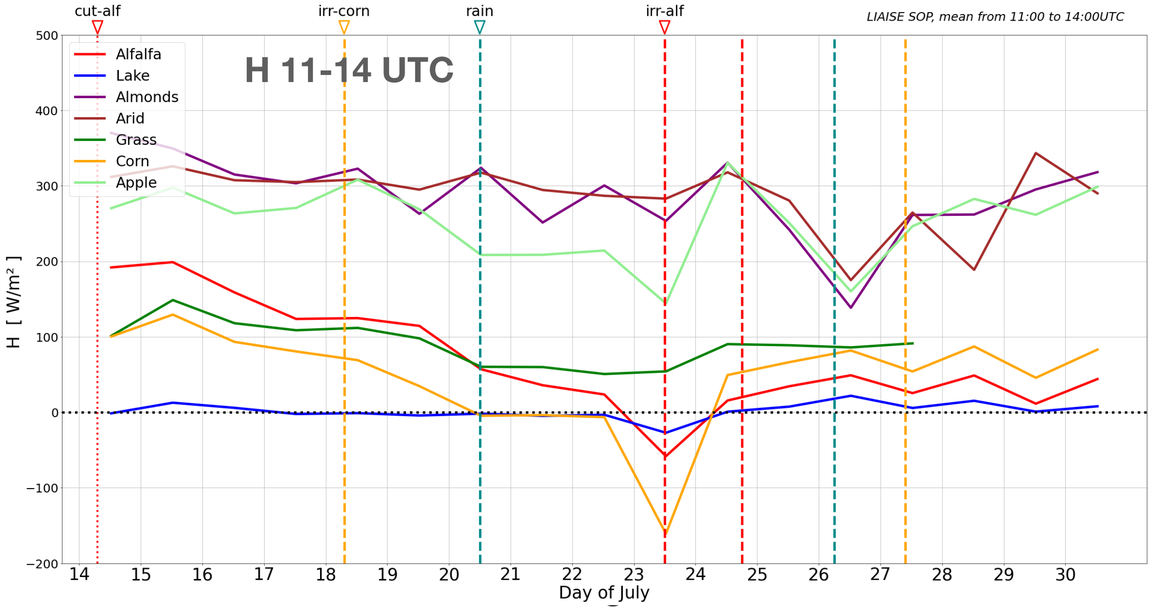


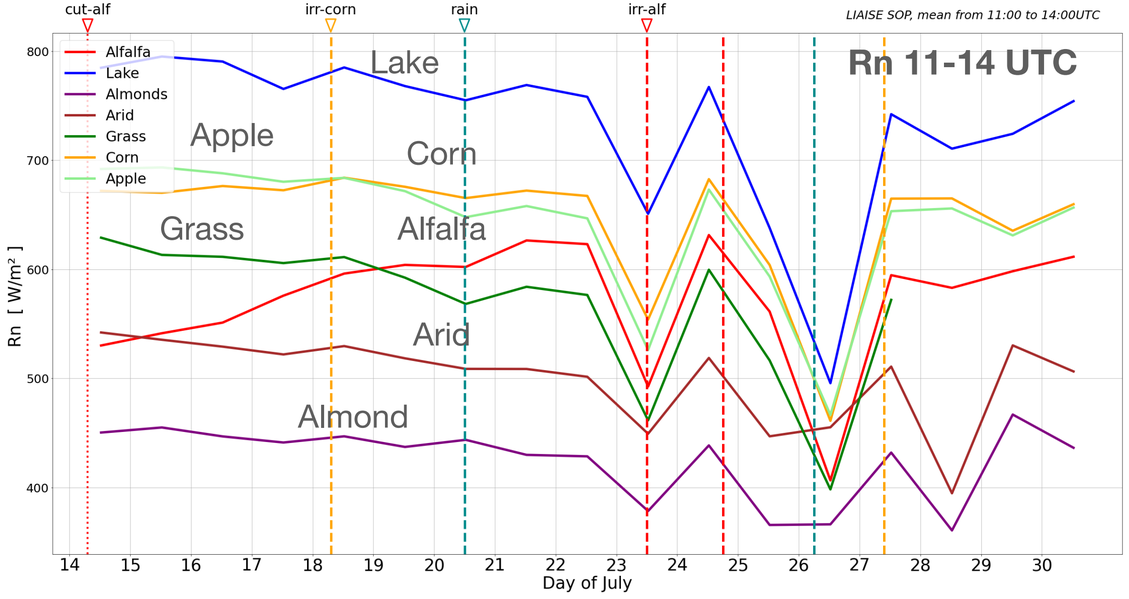

LIAISE SOP: LE noon
LE 12 UTC
rain
irr-corn
cut-alf
irr-alf
arid
almond
grass
apple
corn
alfalfa
lake
fao56_h
pt_1.26
P-T
P-M
Alfalfa
Corn
Grass
Apple
Lake
Almond
Arid
LE (W/m2)
day of july

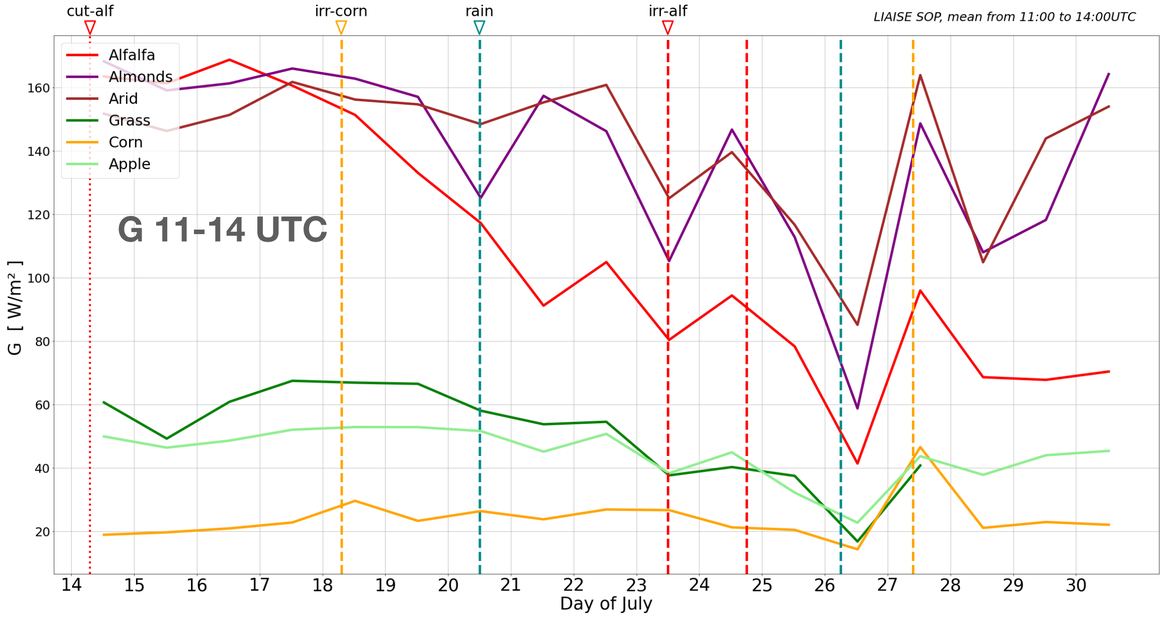

LIAISE SOP: Els Plans 9-15 UTC averages
Weather at Els Plans
14-30 July 2021
T(1.2)-20
q 2m
speed
rain
irr-corn
cut-alf
irr-alf
irr/10
H
LE
dir
West
T
Rain
Windy, SE
T(ºC), q(-), vel (m/s)
fluxes (W/m2) and dir (º)


Boldú
La Cendrosa
Alfalfa
Lake
Ivars
Corn
Apple
Grass
Mollerussa
ET
(mm/day)
0
2
4
6
8
Arid
Els Plans
Preixana
Almond
Verdú
0 2.5 5 km


cut-alf
irr-corn
rain
irr-alf
LIAISE SOP, mean from 11:00 to 14:00UTC
LE 11-14 UTC
Alfalfa
Lake
Almonds
Arid
Grass
Corn
Apple
LE [W/m²]
Day of July

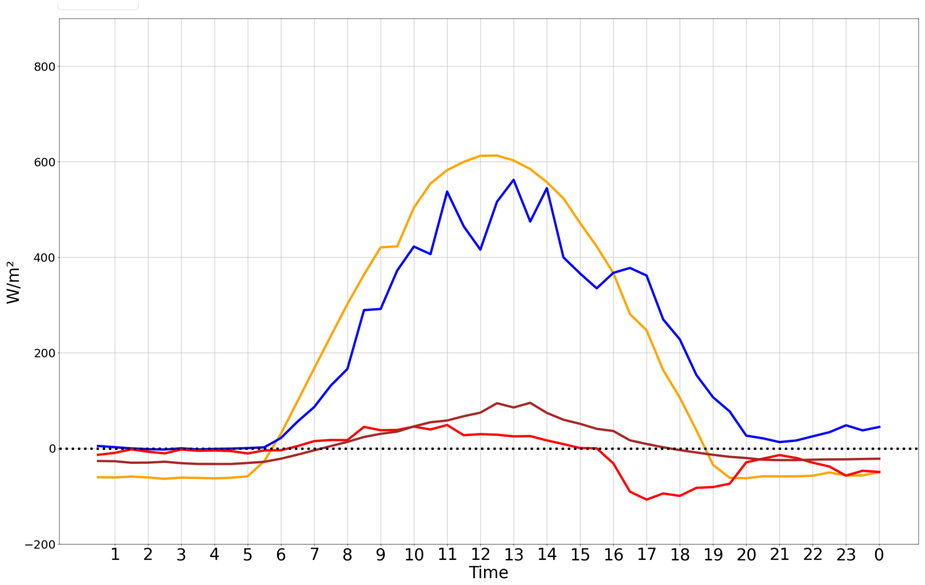

cut-alf
irr-corn
rain
irr-alf
LIAISE SOP, mean from 11:00 to 14:00UTC
H 11-14 UTC
Alfalfa
Lake
Almonds
Arid
Grass
Corn
Apple
H [W/m²]
Day of July


cut-alf
irr-corn
rain
irr-alf
LIAISE SOP, mean from 11:00 to 14:00UTC
Rn 11-14 UTC
Alfalfa
Lake
Almonds
Arid
Grass
Corn
Apple
Lake
Apple
Corn
Grass
Alfalfa
Arid
Almond
Rn [W/m²]
Day of July

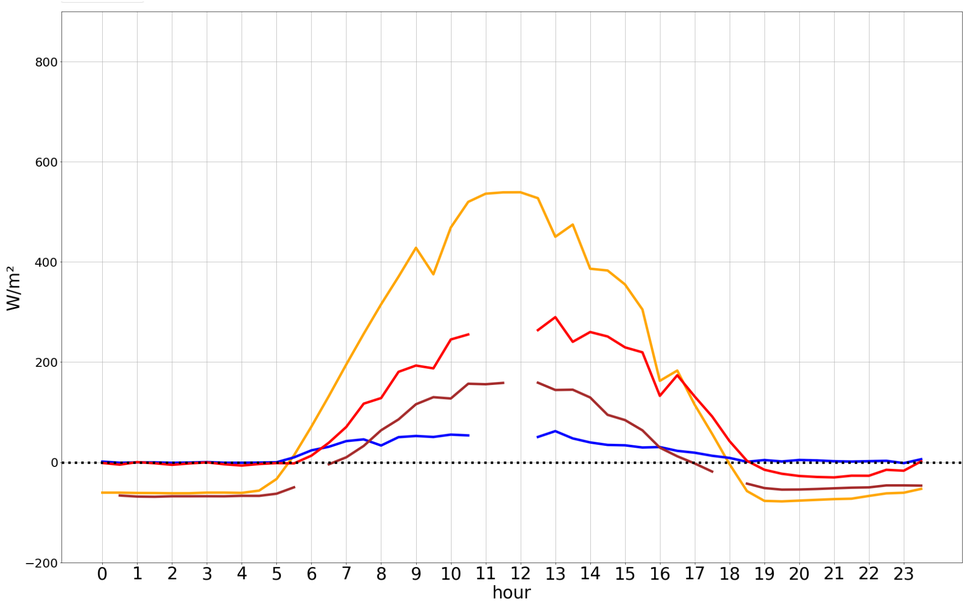

cut-alf
irr-corn
rain
irr-alf
LIAISE SOP, mean from 11:00 to 14:00UTC
G 11-14 UTC
Alfalfa
Almonds
Arid
Grass
Corn
Apple
G [W/m²]
Day of July

July 27th: 24h cycle

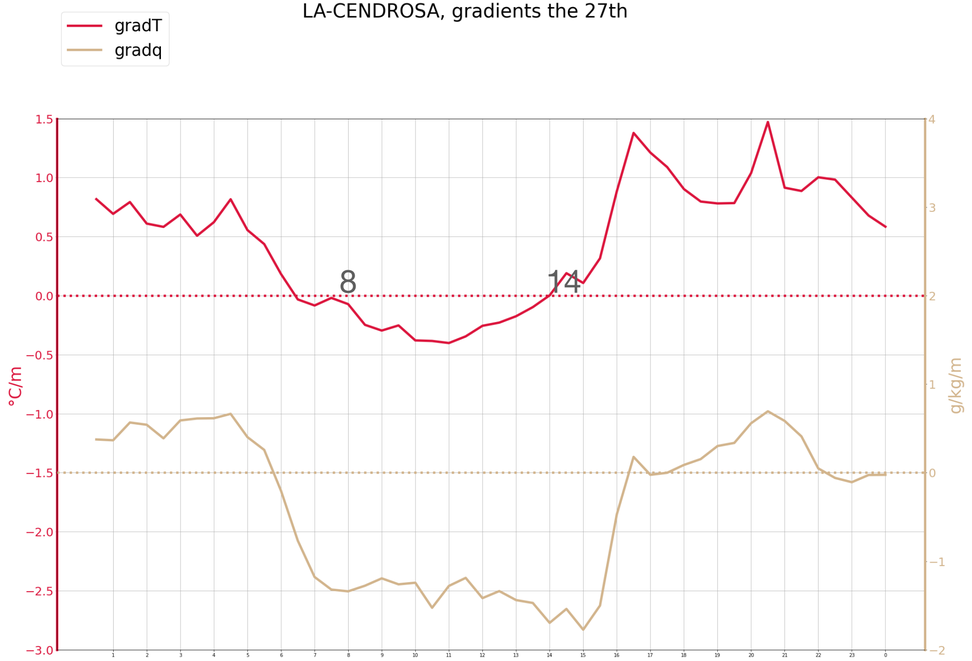
Alfalfa



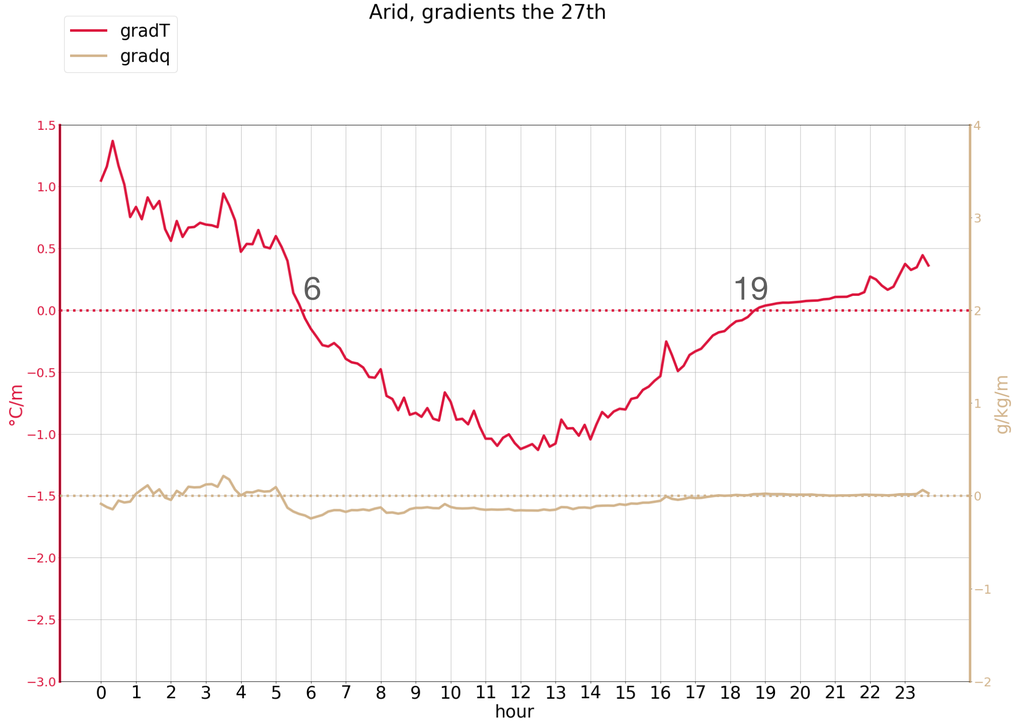
Arid



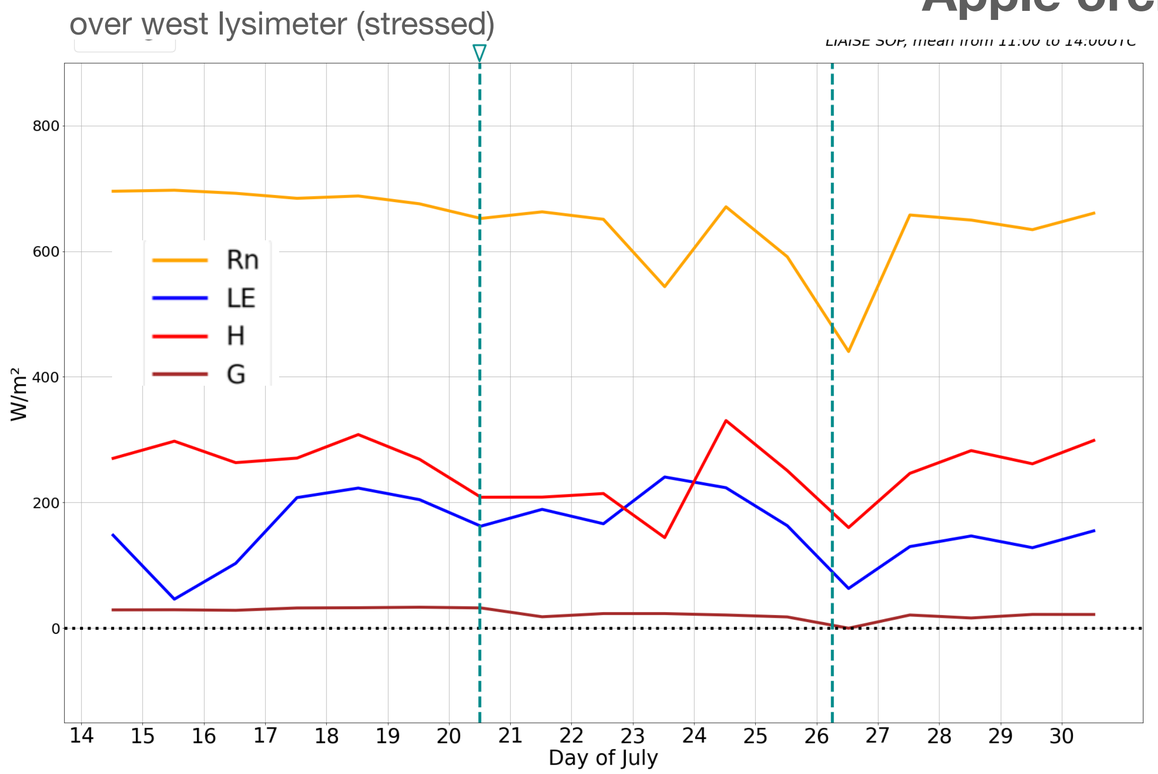
LA-CENDROSA, gradients the 27th

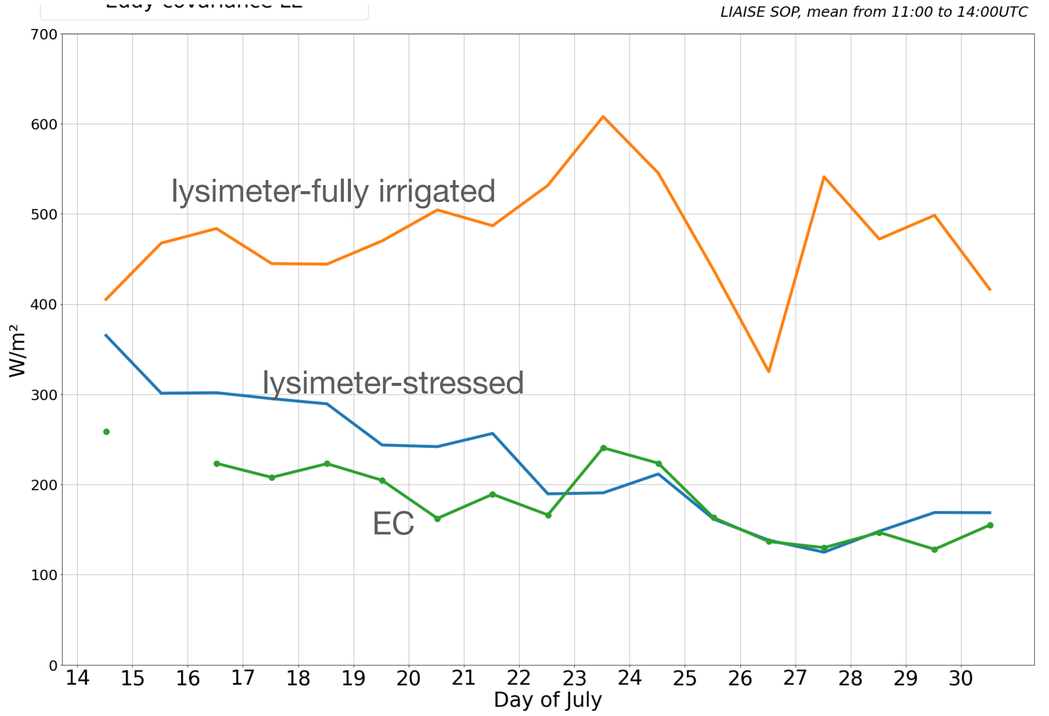


Arid, gradients the 27th

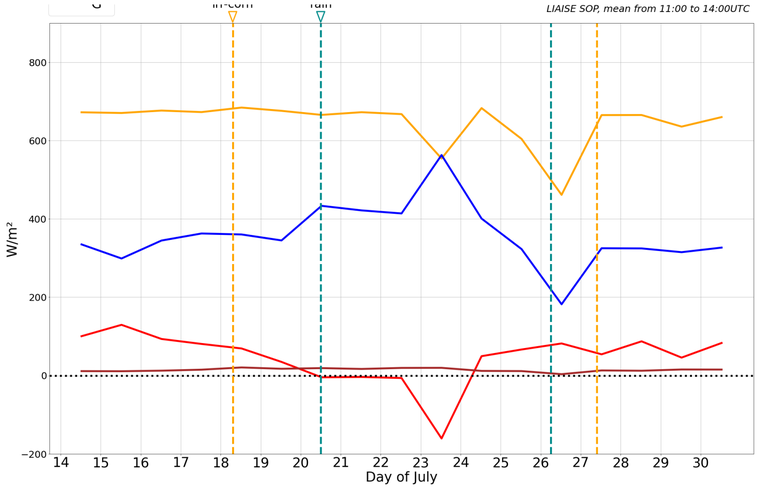


Apple orchard

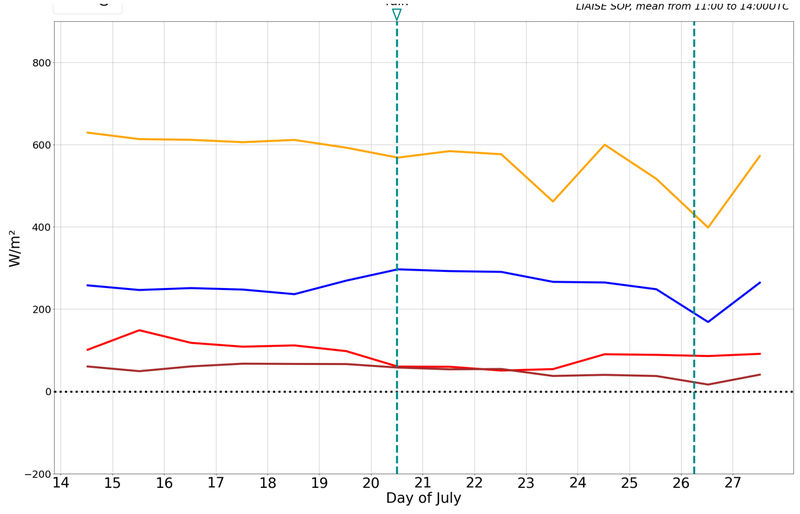




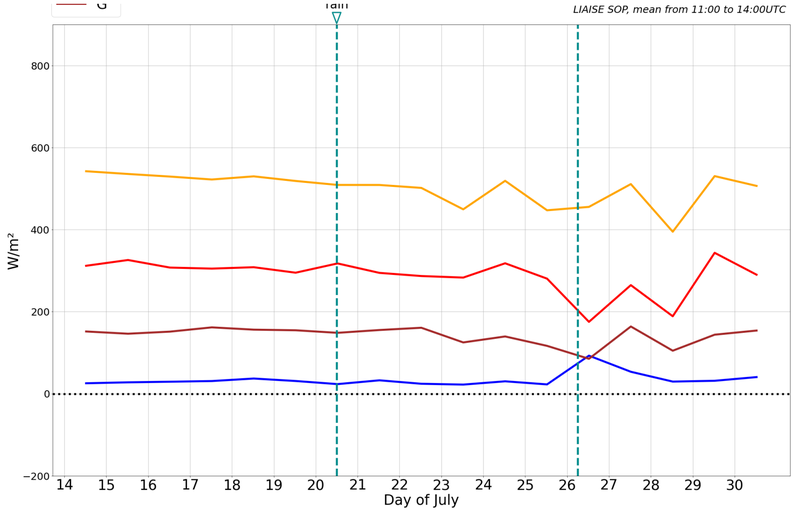
Corn



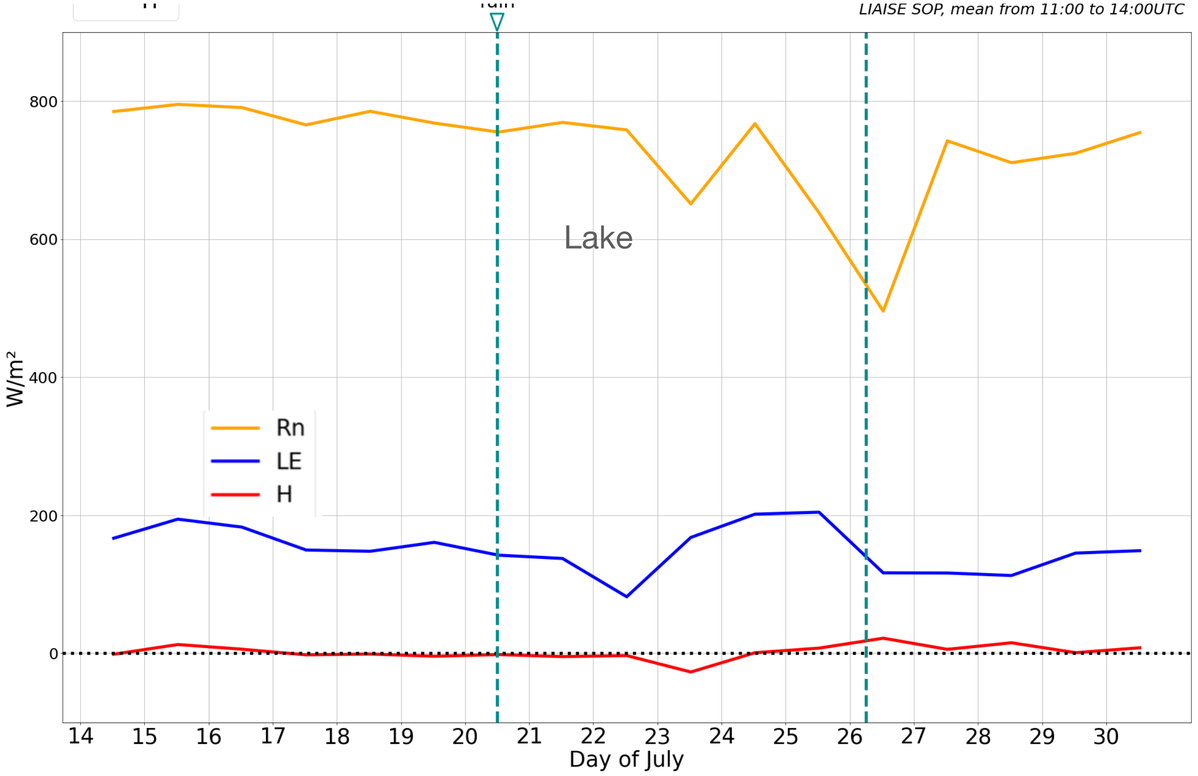
Grass

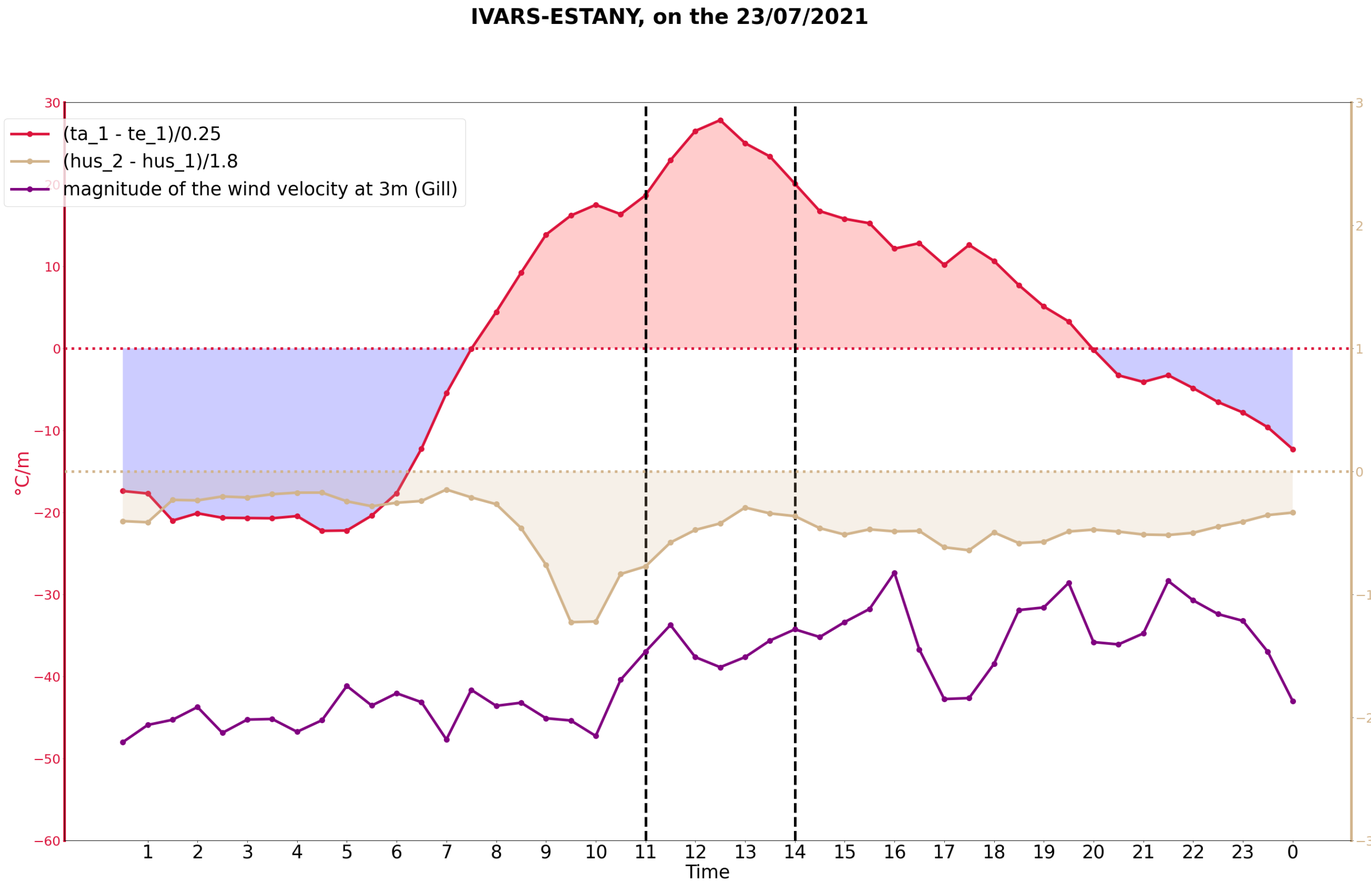


Arid



Station over lake Ivars





Concluding remarks

*During the progressive heating period (14-23 july) the crops increase ET with increasing T

*During the same period rainfed sites are insensitive to the T change, while the lake shows slightly decreasing ET.

*During the windy hot advection event, ET is maximal over well-watered crops, not for stressed ones

*Net radiation input is larger for well-watered surfaces (lower albedo).
Rainfed surfaces warmer as this energy is mostly used to heat the surface not to evaporate water.

*Intense evaporation may imply strong cooling at the surface and the establishment of stably stratified conditions near the surface even during the daytime.

*Penman-Monteith and Priestley-Taylor seem to provide values higher than observed even for well-watered crops.

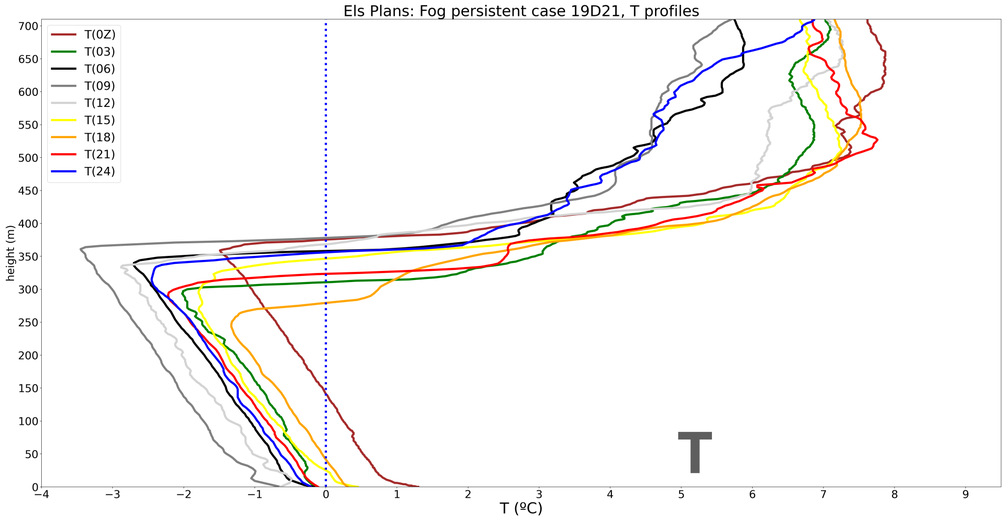
*G~0.1 Rn seems to hold for vegetated surfaces (even smaller for corn),
G~0.3 Rn for rainfed areas or mixed vegetation-bare terrain (like alfalfa after cutting)

*ET from the lake is smaller than for well-watered crops, either because thermal production of turbulence is weak or even negative inhibiting vertical transport or because most energy is transported into the lake (G, not available).

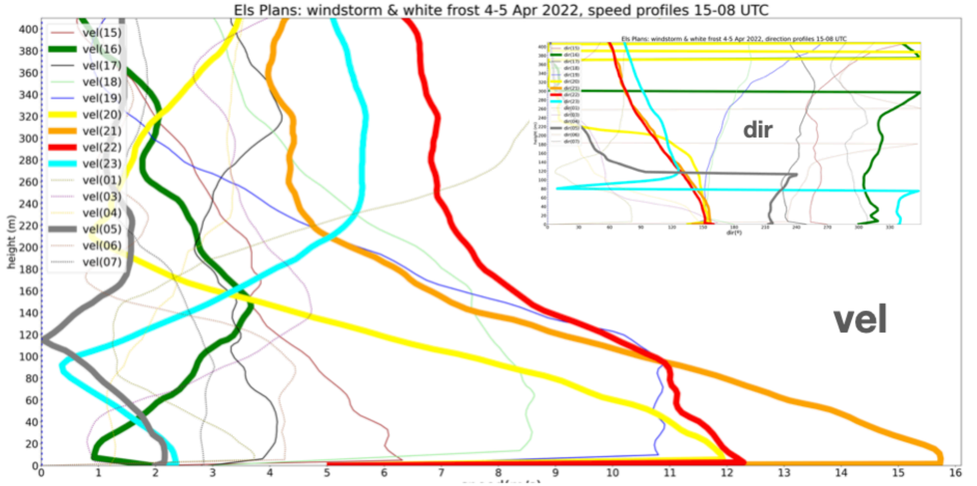
*The apple orchard ET when stressed is much less than when it is well-watered. However the grass-bare soil mixture in the wide corridors between tree lines produces also a significant value of sensible heat flux compared to corn or grown alfalfa

Special measurements in the LIAISE area after the LOP

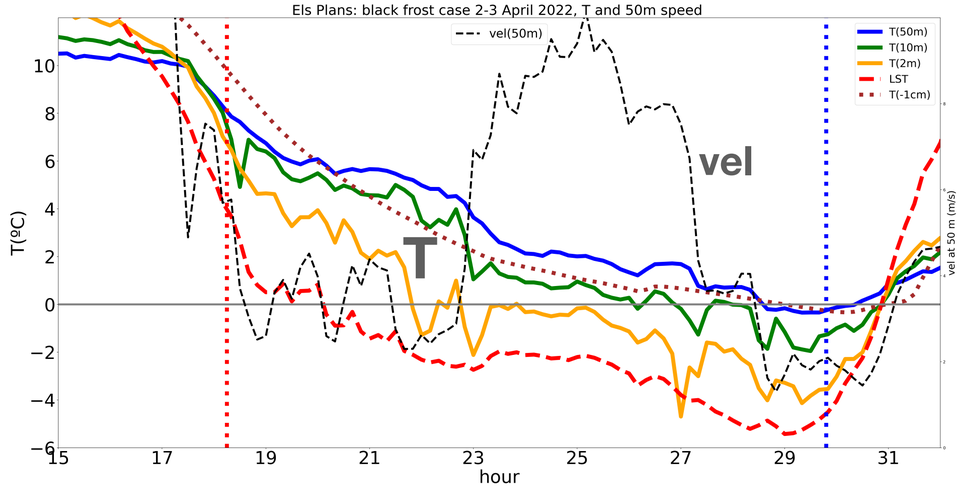
A persistent Fog event



Gravity flows



Black frost



BASTA radar: reflectivity