Exercise 3 dynamics - Course atmospheric processes

Josué Gehring

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The exercise today is to analyse a given weather situation over Europe. You will discuss the exercises below in groups of about 4 persons.

1 Satellite animation

1. Open the file `Eumetsat_RGB_20231114.gif` on Moodle.
2. Read the documentation of the "Airmass RGB" product. It is also on Moodle as a PDF.
3. Analyse the satellite animation. Do you see any of the weather systems we discussed in the course? Try to identify their locations on the satellite image.

2 Mean sea level pressure and temperature

1. Open the file `IFS_850hPa_thetae_mslp_20231114.gif`. It shows an animation of 850 hPa equivalent potential temperature and mean sea level pressure from the IFS model of the European Centre for Medium Range Weather Forecasts (ECMWF). The equivalent potential temperature represents the temperature an air parcel would have if all the moisture would condense and thus release latent heat, and the parcel was brought adiabatically to a reference level (usually 1000 hPa). It is hence always equal or greater to potential temperature and represents the potential warming of the air by latent heat release. It therefore depends on both the air temperature and its humidity content. It is very useful to identify different air masses and fronts, since they are defined as both a sharp gradient in temperature and humidity content. It is also used to assess the static stability of saturated air masses.
2. Do again the same analysis as with the satellite animation. Are your conclusions any different? Try to identify the three main low pressure systems. Does one look more intense than the others? Mark them on Fig. 1.

3 Mean sea level pressure and wind speed at 300 hPa

1. Open the file `IFS_300hPa_wind_mslp_20231114.gif`. It shows the an animation of 300 hPa geopotential height and mean sea-level pressure from the IFS model.
2. Identify the strongest jet streak on the animation

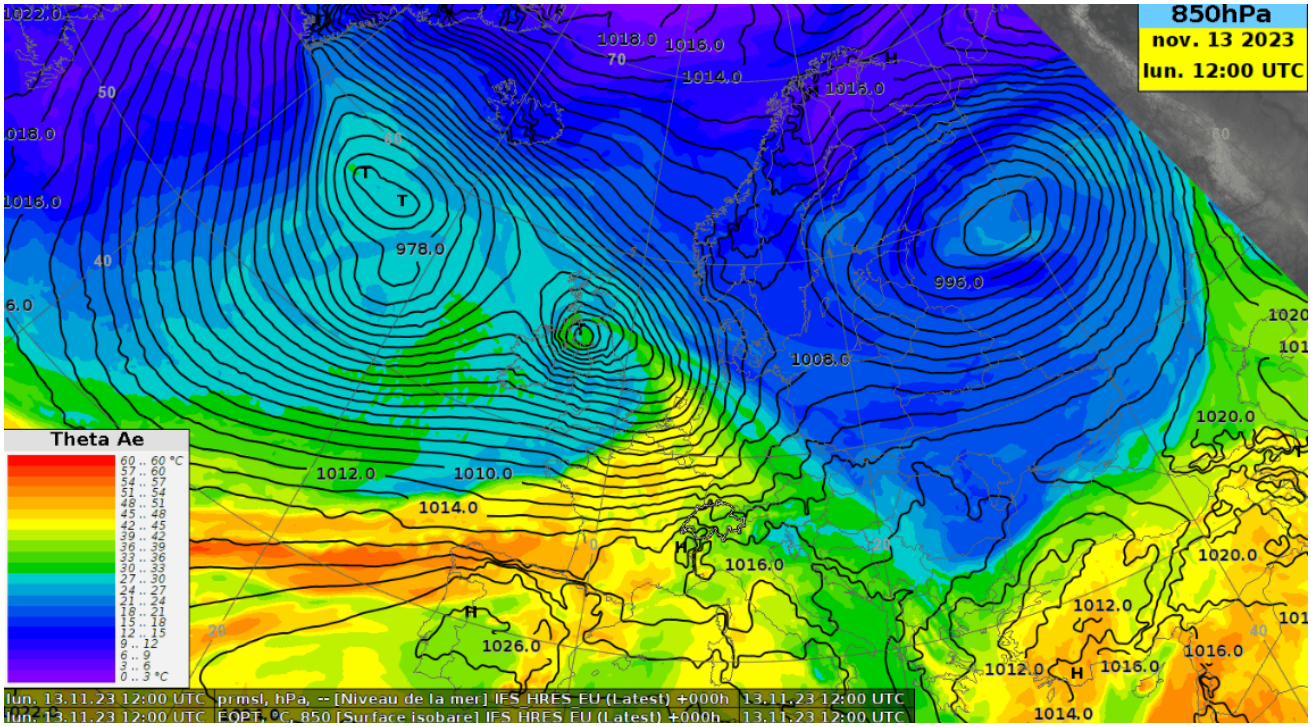

Figure 1: Equivalent potential temperature at 850 hPa (colour shading) and mean sea level pressure (black contours, labels in hPa) at 12 UTC on 13 November 2023.

3. Anlayse the evolution of the strongest low-pressure system that you identified before. What can explain the intense development of this low-pressure system?

4. If you were to issue a weather warning for strong surface winds in northern Europe, which regions will you warn? Assume the surface wind is purely geostrophic. Draw these regions on Fig. 2 and highlight the region where you expect the strongest wind overall.

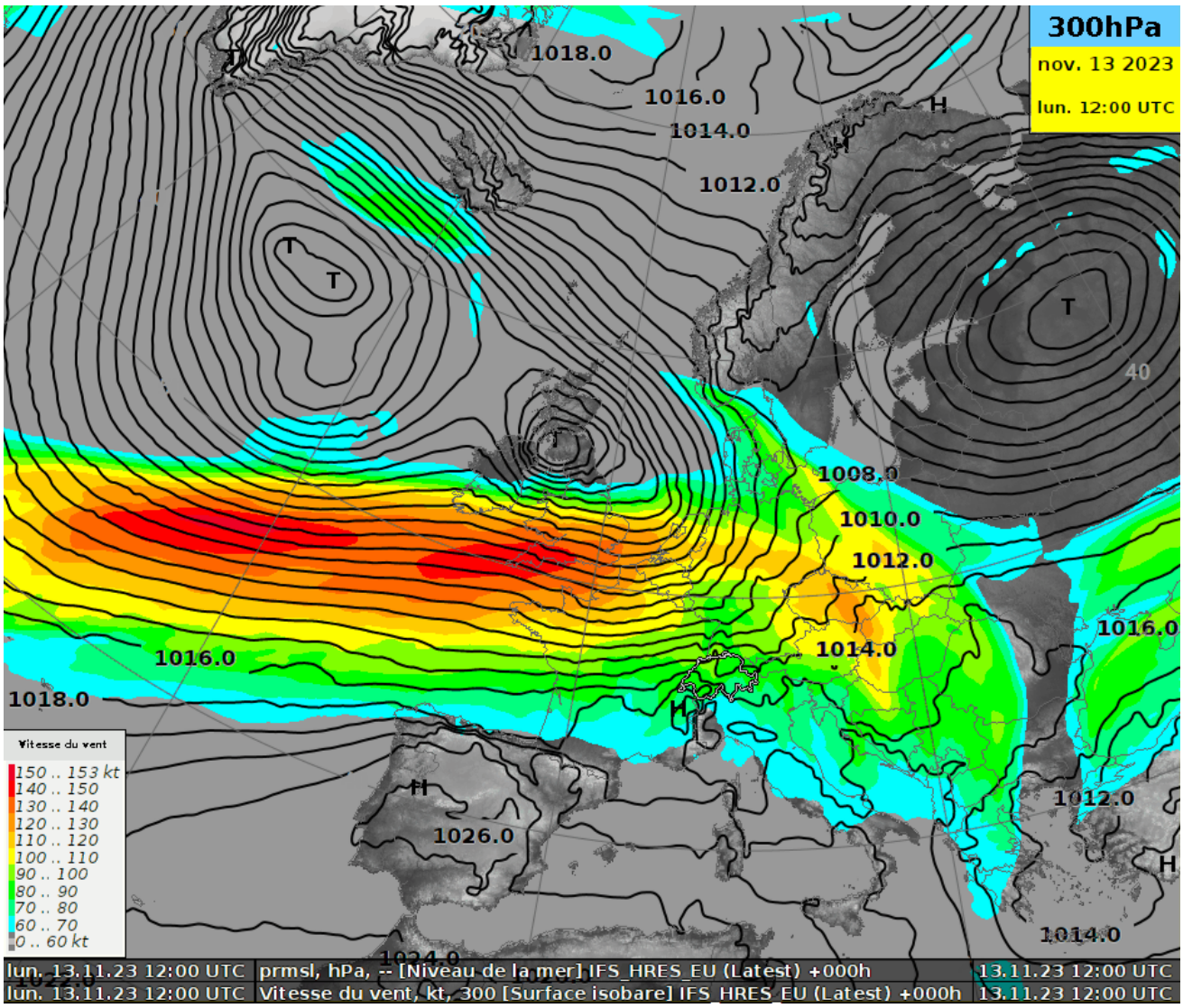

Figure 2: Wind speed (colour shading) at 300 hPa and mean sea level pressure (black contours, labels in hPa) at 12 UTC on 13 November 2023.