3. SUMMER 2016: SEVERE DRYING OUT

First, we select only the cases with a WEAK LARGE-SCALE FORCING (i.e., $V_{fmax} < 6$ m s$^{-1}$ no synoptic fronts + precipitation_day < 0.5 mm). Around 30% of the total amount of days are rejected. We plot the wind roses during different time ranges for the hot-weather days:

![Wind rose diagram](image)

**Figure 3.** Recorded precipitation from 01/04/2016 to 05/04/2016 on San Sebastián de los Reyes (Madrid, Spain). [Source: AEMET]

**Figure 4.** The Bowen ratio increases throughout the summer (Fig. 3), particularly due to the lack of precipitations in the second half of the season (Fig. 4) and the very high temperatures (not shown).

**Figure 5.** Evolution of the daily Bowen ratio lower for the summer. We include shaded areas of typical values for semiarid landscapes, water-stressed crops, temperate forest and grasslands and tropical rain forests.

**Figure 7.** Wind roses for the selected large-scale stable days: (a) during UPSLOPE conditions (10-11 UTC), (b) during CENTRAL-HIGH (11-15 UTC) and (c) during DOWNWIND conditions (20-24 UTC).

For the days with a weak large-scale forcing (stable days in Table 2), the percentage of days with runway-conversion change increases throughout the summer.

4. DIURNAL MOUNTAIN WIND SYSTEM

![Diagram](image)

**Figure 8.** Evolution throughout the summer of the mean wind speed during each of the stages: (a) UPSLOPE, (b) CENTRAL-HIGH and (c) DOWNWIND. In (a) and (b) the mean wind speed is computed considering the first two hours in each direction range.

**Figure 9.** Evolution throughout the summer of the maximum friction velocity at the different stages during the central hours (a) and the katabatic stage (b). The maximum friction velocity at the central hours is juxtaposed for the days showing a clear katabatic stage.

**Table 1.** Percentage of time in which we detect each of the stages from the total amount of days for the first part (June-July) and the second part of the summer (August-September).

5. AIRPORT ISSUE

The preferential runway configuration at the airport of Madrid in summer is the North Configuration due to noise issues in close neighborhoods. However, it has to be switched to South Configuration when the southwesterly winds exceed 10 knots.

6. TAKE-HOME IDEAS

- **Summer 2016** was characterised for its progressive and extreme drying out in the soil.
- Analysis of the diurnal mountain winds throughout the summer:
  a) Upurate/anabatic winds increase substantially in frequency but their intensity remains unchanged.
  b) Downwinds/anabatic winds do not increase either in frequency or intensity, but the associated turbulence decreases slightly.
  c) The combinations of upwinds + upwinds in central hours increases both in intensity and in the associated turbulence.
- The wind in the central hours undergoes an intensification over the summer that increases an increase of the runway-configuration change from North to South at the airport of Madrid.

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