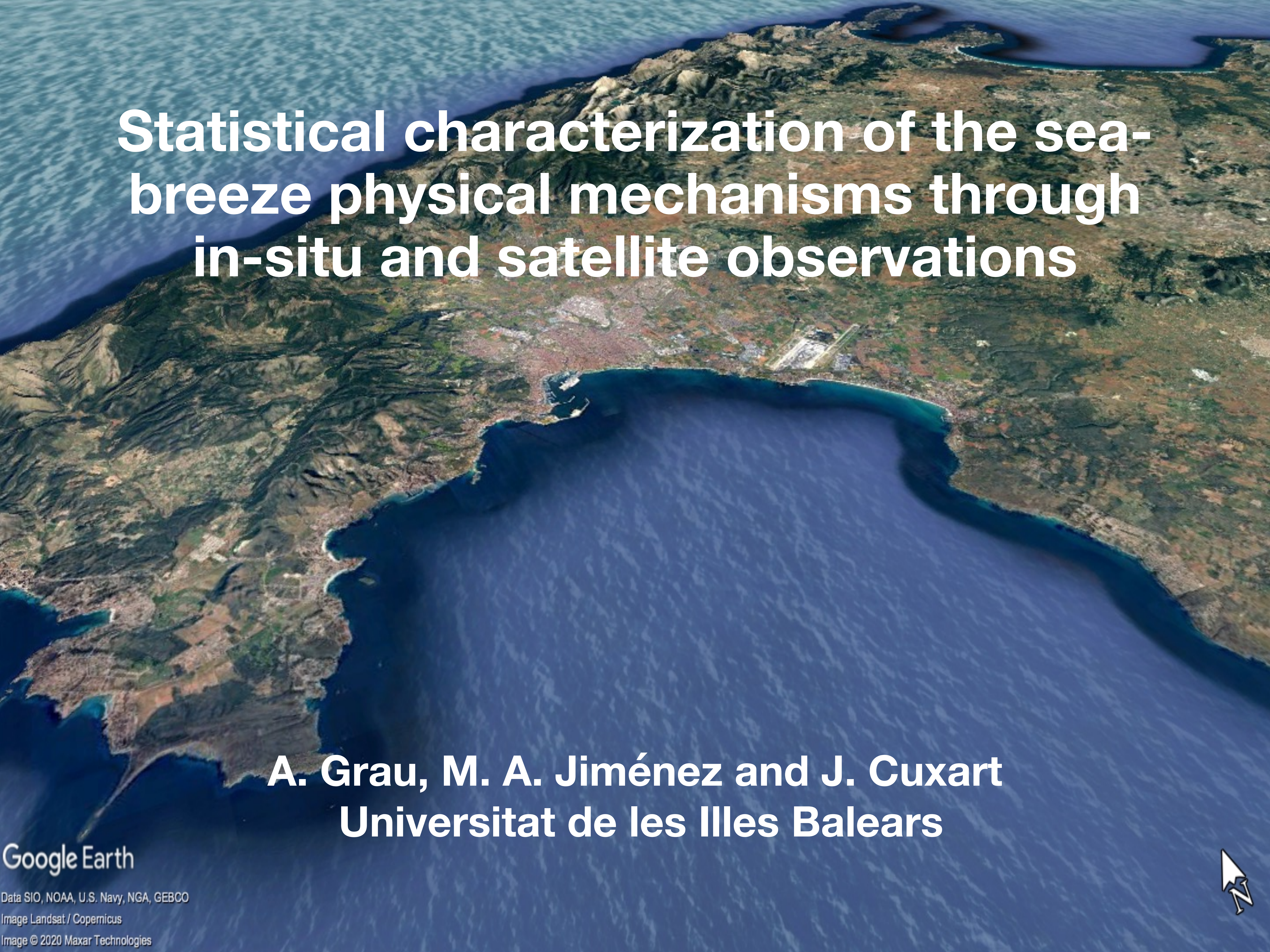
Statistical characterization of the sea-breeze physical mechanisms through in-situ and satellite observations



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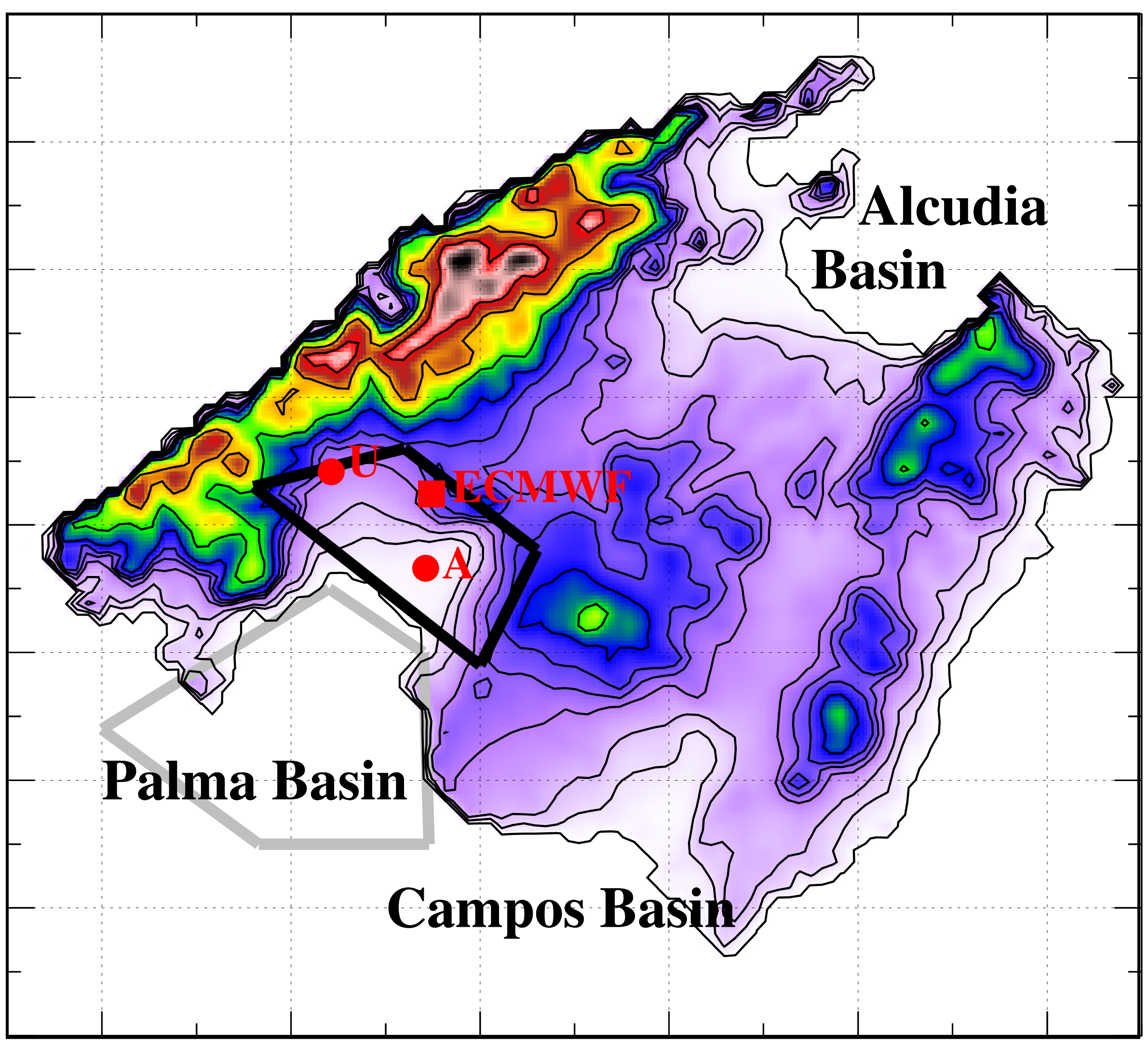
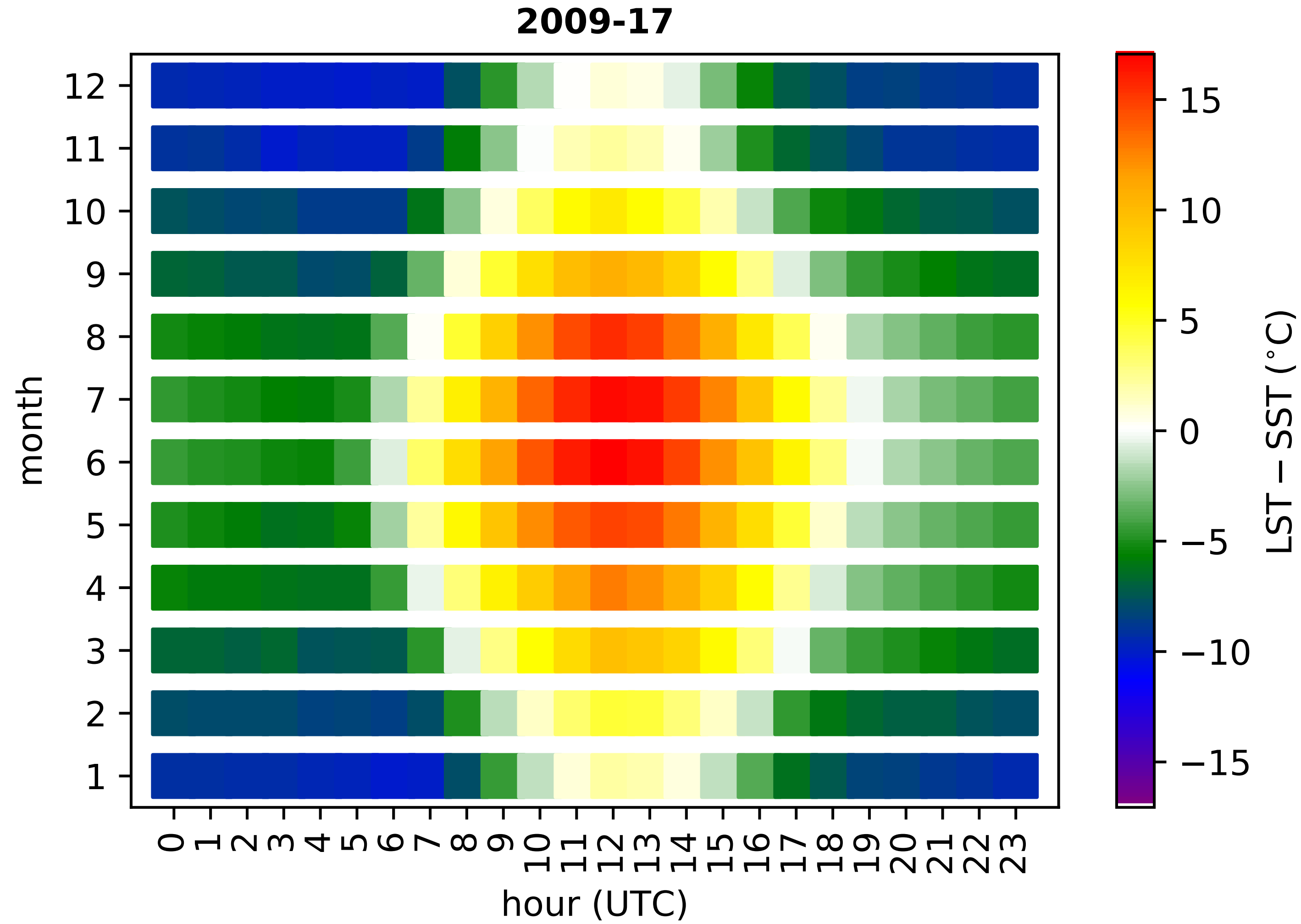
MOTIVATIONS

- The aim of this work is to statistically **characterise** some of the **physical mechanisms** involved during **Sea-Breeze** (SB) conditions in a complex terrain island, such as the temperature difference (both on the surface and the vertical) responsible of its formation, the importance of the soil moisture and the influence of the large- scale winds on the SB features.

Topography of the island and location of the Palma basin



Monthly average temperature difference for each hour



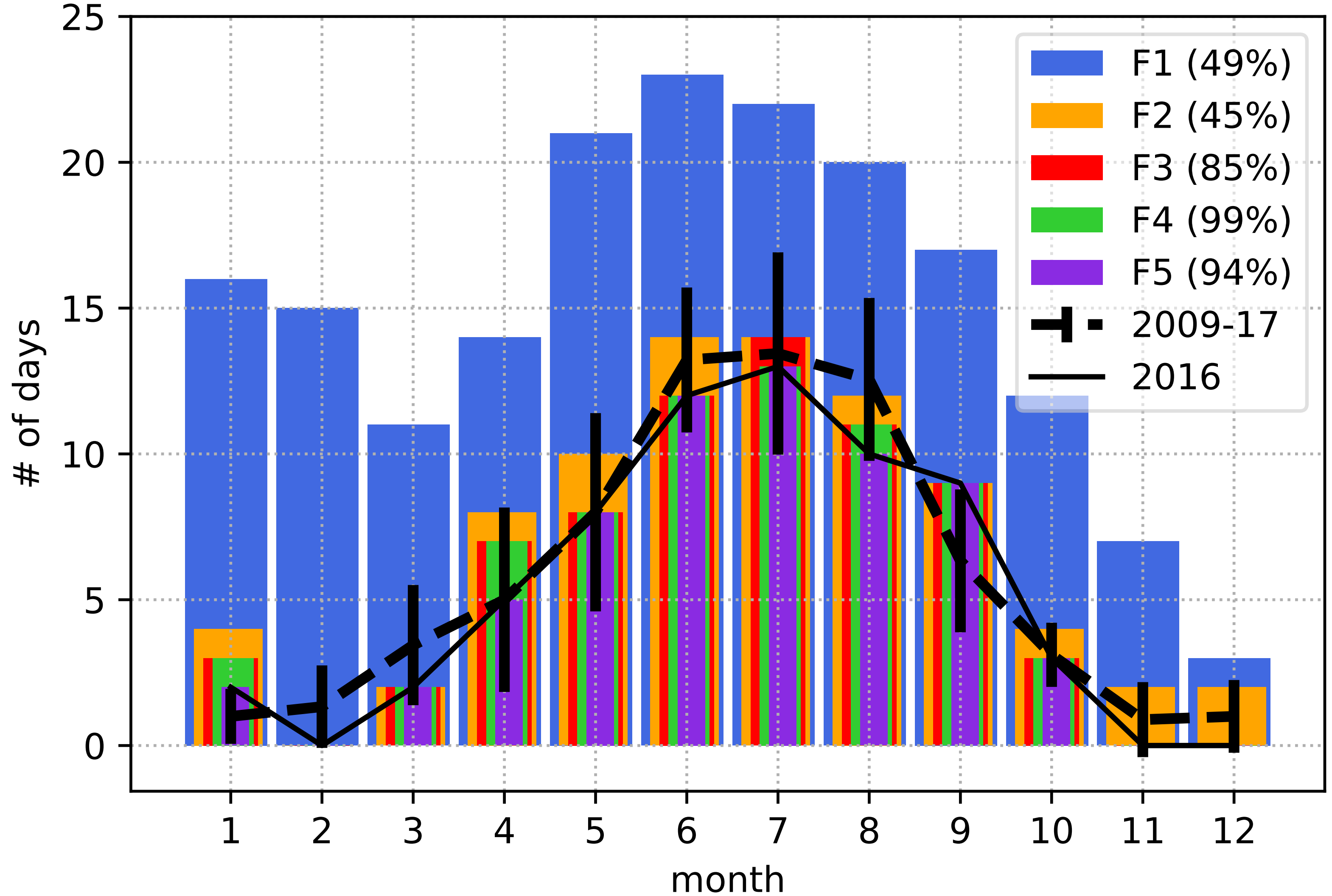
Months when LST-SST reach larger values correspond with the months when sea-breeze is typically more frequent.

METHODOLOGY

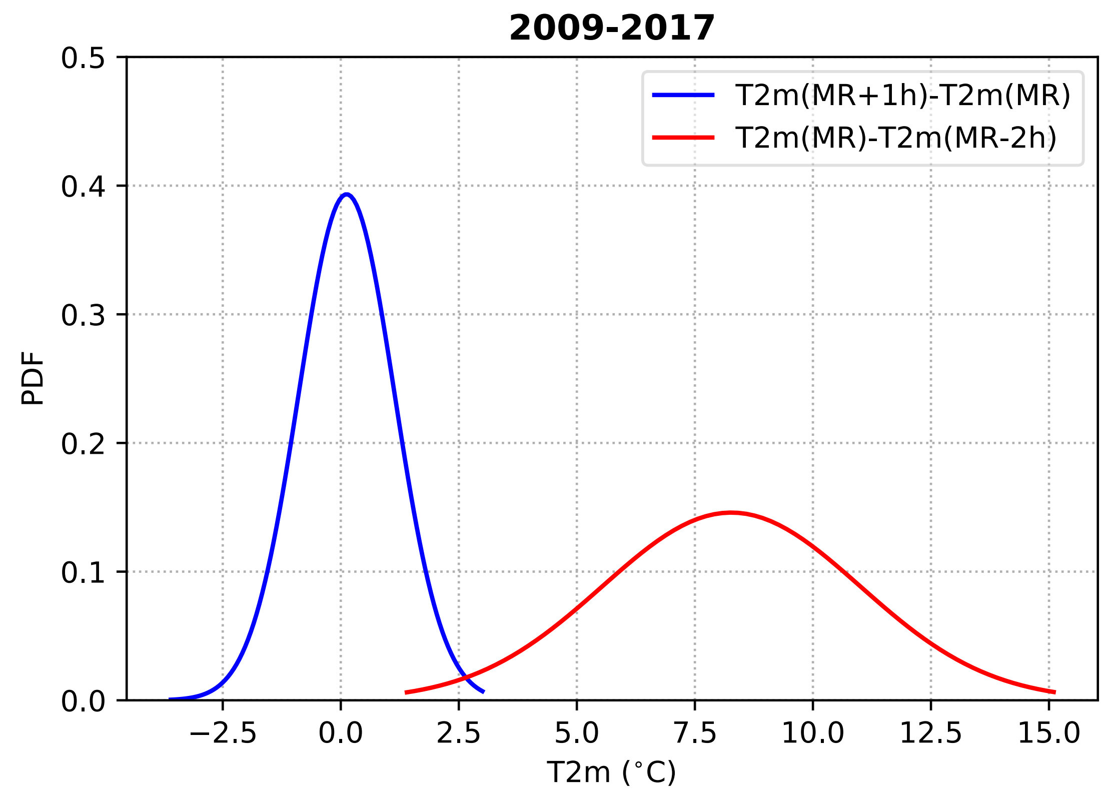
A similar approach to the method proposed in *Borne et al. (1998)* was designed to select those days in which it is possible to guarantee the SB establishment.

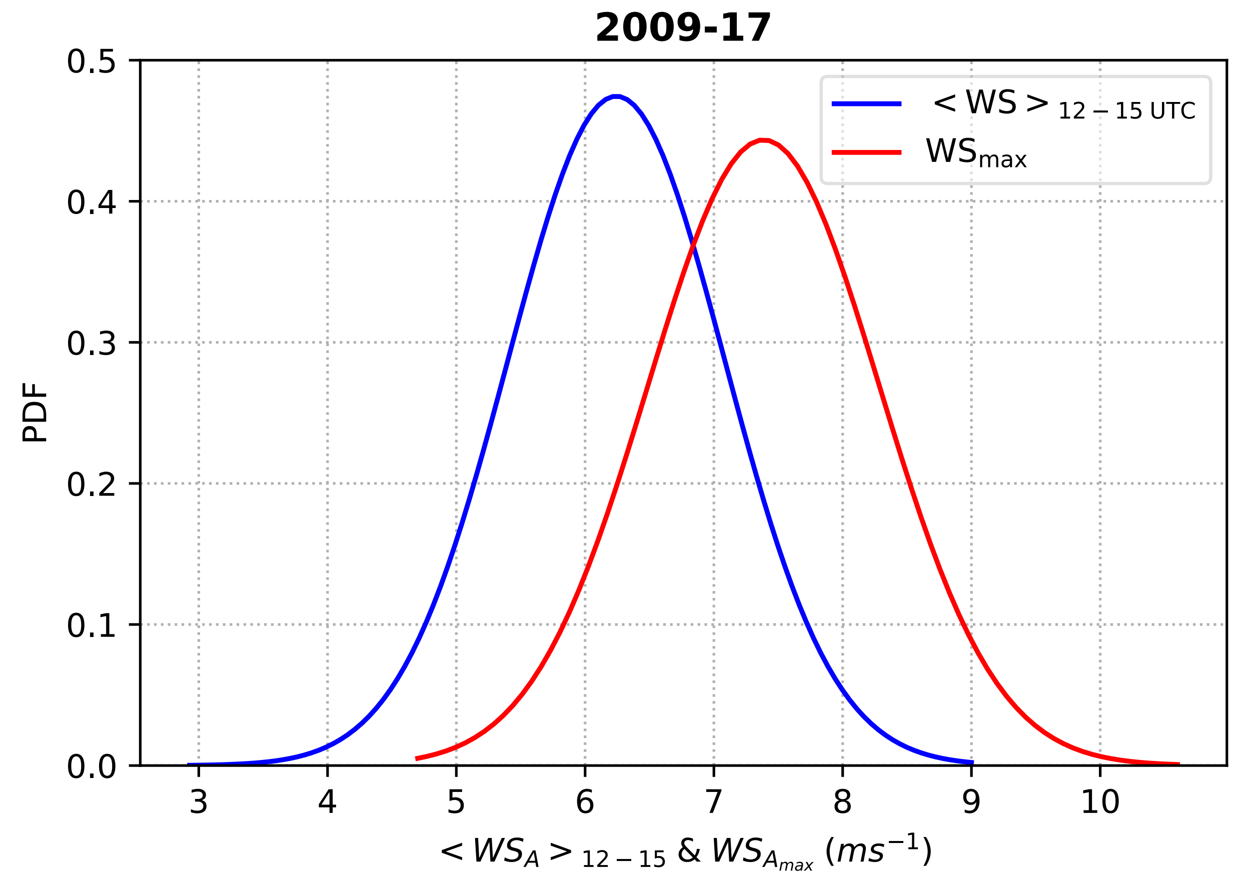
Filter	Description
F1	During the mature phase of the SB (1200-1500 UTC), wind direction at the Airport is from [180°,270°]
F2	Eliminate SW large-scale winds imposing that under SB conditions slope winds are found at the foothills, wind at the University is from [135°,225°]
F3	Wind must veer two times per day: morning (0600-1200 UTC) and afternoon (1800-0000 UTC). Moreover, the first one must occur at least one hour after sunrise
F4	Calm wind conditions take place during the MR and wind increases afterwards. Therefore, the wind speed 2 h after the MR must be greater than 1 h before
F5	Daily rain should be equal to 0 because clouds or rain can impact of the thermal gradient to generate SB

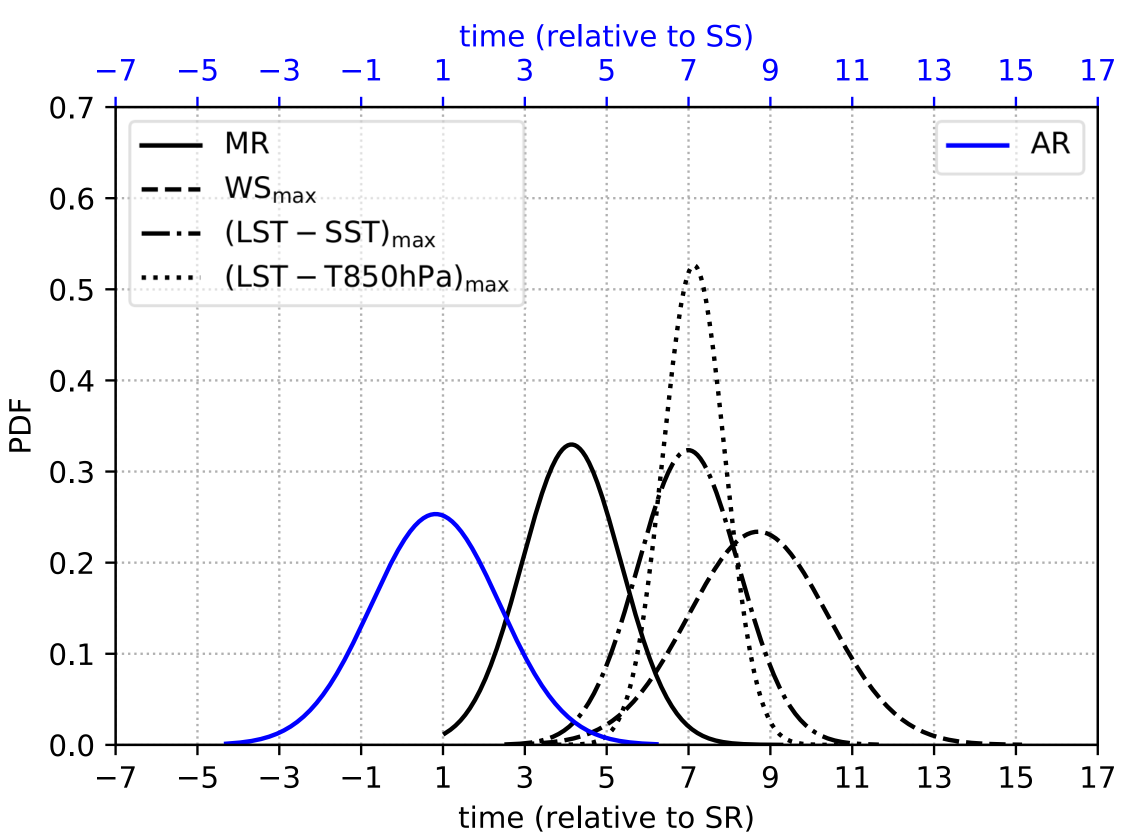
1. This pattern correspond to year 2016 although it is remarkably similar to the rest of the years (2009-2017).
2. Although most of the cases occur between April and September, there are some cases in winter too.
3. Similar results were obtained from other studies.



SOME RESULTS







1. Once the SB is established, the T2m levels off due to the cold advection from the sea.
2. The MR occurs before the maximum LST-SST.
3. The horizontal and vertical thermal gradients are maximum simultaneously.
4. The maximum Wind Speed (WS) takes place 2h later than the maximum of LST-SST.

OTHER RESULTS ALSO OBTAINED…

- Under SB conditions LST-SST is larger than 5ºC during the central hours of the day.
- Large-scale winds can advance or delay the SB onset.
- The SB intensity is strongly linked with the soil water content.
- Upslope winds generated inside the basin influence the SB propagation.

See further information in:

Grau et al. (2020) Statistical characterization of the sea-breeze physical mechanisms through in-situ and satellite observations. *Intenational Journal Of Climatology*, DOI: 10.1002/joc.6606

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RESEARCH PROJECTS

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