1. LA HERRERÍA

This analysis is performed in La Herrería Forest located at the foothills of the Guadarrama Mountain Range (Spain), at around 50 km from the city of Madrid.

2. OBSERVATIONS

In this work we use 10-minutes meteorological measurements carried out during an intensive summer campaign of 2015-2016.

3. KATABATIC DETECTION

We apply an objective and systematic algorithm to the observational data in order to select the events that fulfill katabatic-event criteria.

4. NATURE

4.1) Close relationship between katabatic intensity & thermal stratification at the onset

Thermal stratification at the katabatic onset is directly linked to turbulence.

4.2) Nonlinear stratification at the katabatic onset is directly linked to turbulence.

Maximum katabatic intensity (between onset and 01 UTC) at 6 m s⁻¹ turbulent kinetic energy (TKE) at 8 m of the onset.

5. INTERACTION WITH TURBULENCE

5.1) Downward sensible heat flux and surface energy balance

Downward sensible-heat flux (H > 0) is the katabatic intensity at 6 m s⁻¹ and the heat flux demanded (H₀) at surface (right).

5.2) Katabatic regime transition from non-dimensional parameters

We characterize the regime transition from relevant non-dimensional parameters by representing thermal stratification, H, and V₀ as a function of one local and one non-local parameter, U₀ and shear capacity (SC) respectively.

6. FINAL THOUGHT

WE HAVE LINKED THE SYNoptic WIND and LOCAL SOIL-MoISTURE CONDITIONS, WITH Katabatic INTENSITY and the ASSOCIATED SCALE REGIMES FROM THEIR INTERACTION WITH TURBULENCE.

SYNoptic WIND in the Katabatic DIRECTION + LOW SOIL-MoISTURE = EARLY Katabatic ONSET.

UNSTABLE/CONVECTIVE STRATIFICATION → MODERATE TO HIGH TURBULENCE → BULK SHEAR INCREASES → SUBSEQUENT INTENSE Katabatic → NEAR-NEUTRAL/WEAKLY STABLE SBL REGIME.

IF THE CONDITIONS ABOVE FOR THE SYNoptic WIND and SOIL-MoISTURE ARE NOT MET → LATER ONSET. NEUTRAL/STABLE STRATIFICATION → WEAK TURBULENCE → ADVECTIVE DOES NOT COMPENSATE → STRATIFICATION THAT SUPPRESSES TURBULENCE PRODUCTION (POSITIVE FEEDBACK) → WEAK Katabatic PRODUCING A VERY STABLE REGIME.

7. REFERENCES

8. ACKNOWLEDGEMENTS