

Identifying and analyzing fog and low stratus (FLS) life cycle regimes over central Europe

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MOTIVATION

- Fog and low stratus (FLS) life cycle processes important for traffic security and solar power prediction
- No objective classification of FLS regimes exists
- **Aim of the study:** identify FLS life cycle regimes based on the sensitivities of the FLS life cycle to environmental conditions

DATA & METHODS

- Study area: central Europe, time period: 2006-2015
- Satellite-based FLS formation and dissipation time data set (Pauli et al. 2022)
- era5-land reanalysis data: temperature at 2m (t2m), specific humidity at 2m (q), wind speed at 10m (ws), mean surface pressure (msp)

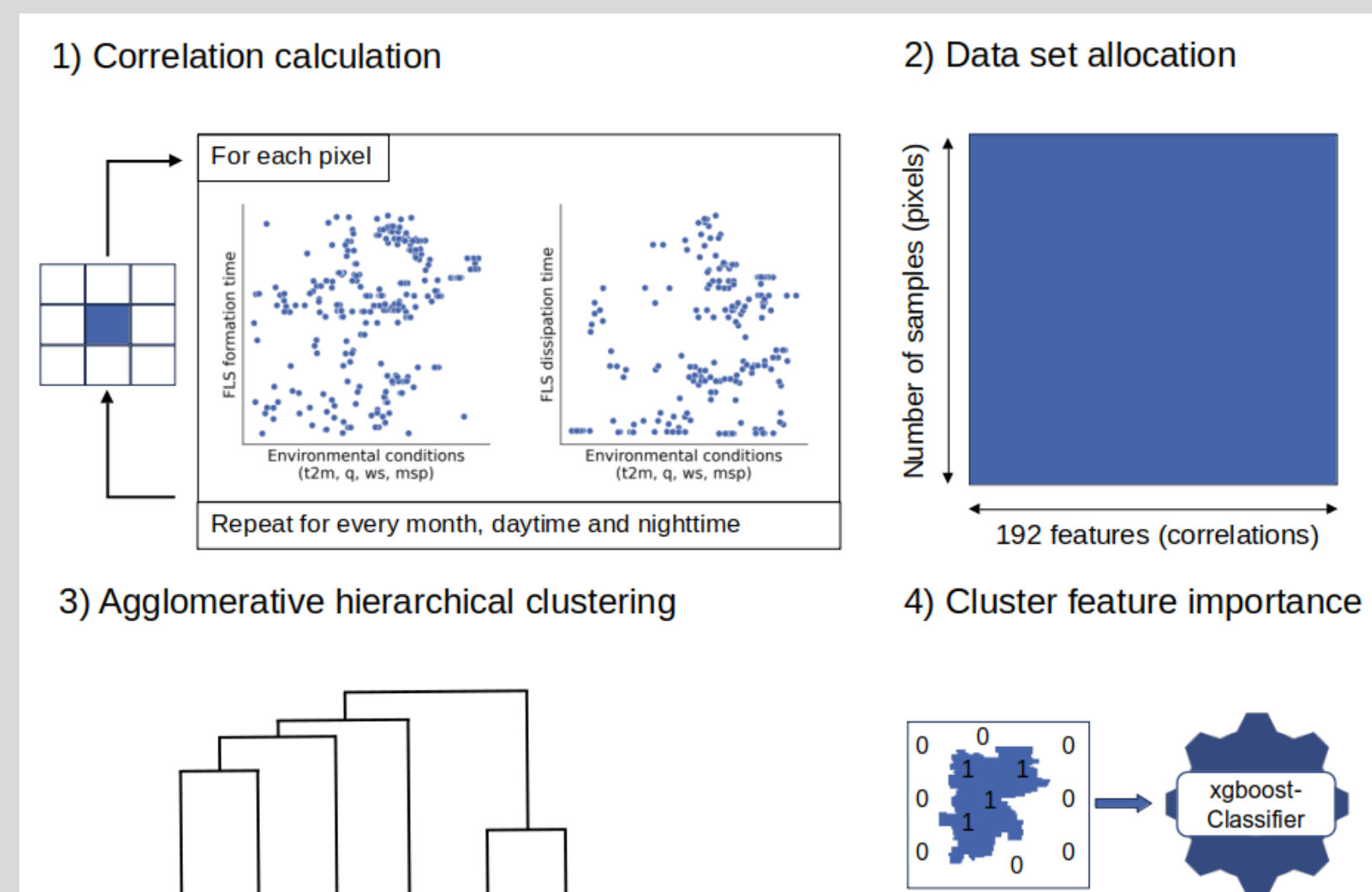


Fig. 1: Schematic overview of the methods used in the study.

References

Pauli, E., Cermak, J., & Andersen, H. (2022). A satellite-based climatology of fog and low stratus formation and dissipation times in central Europe. Quarterly Journal of the Royal Meteorological Society, 148 (744), 1439–1454. doi: 10.1002/qj.4272

RESULTS: FLS LIFE CYCLE REGIMES

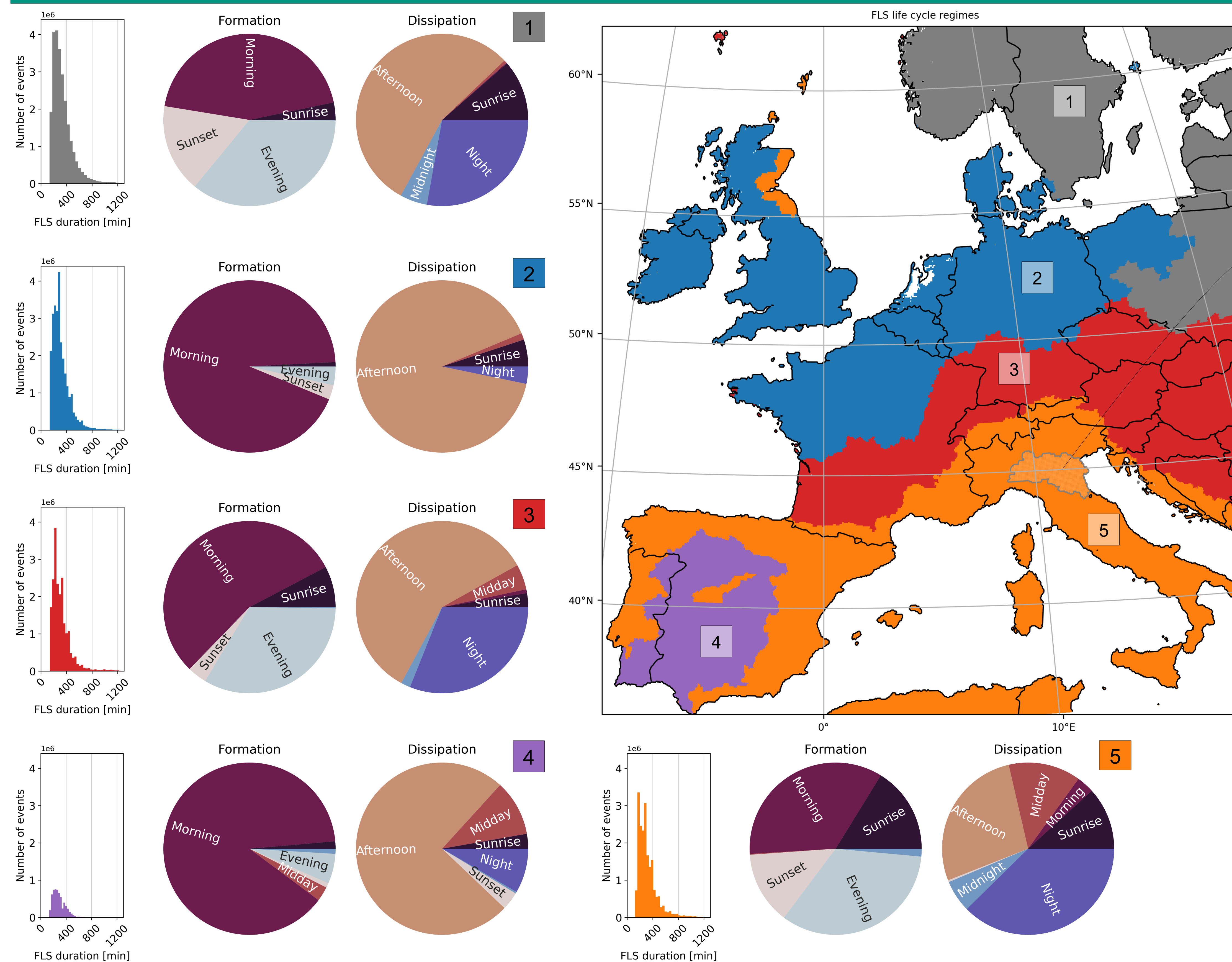


Fig. 2: Spatial map of the five major FLS life cycle regimes identified by the hierarchical clustering algorithm (upper right corner). The histograms show the distribution of FLS event duration for each regime. The pie charts show the most frequent FLS formation and dissipation time for each regime.

CASE STUDY – PO VALLEY

- t2m and q most important features for FLS life cycle regime in the Po valley
- Likely a result of underlying processes of radiation fog development

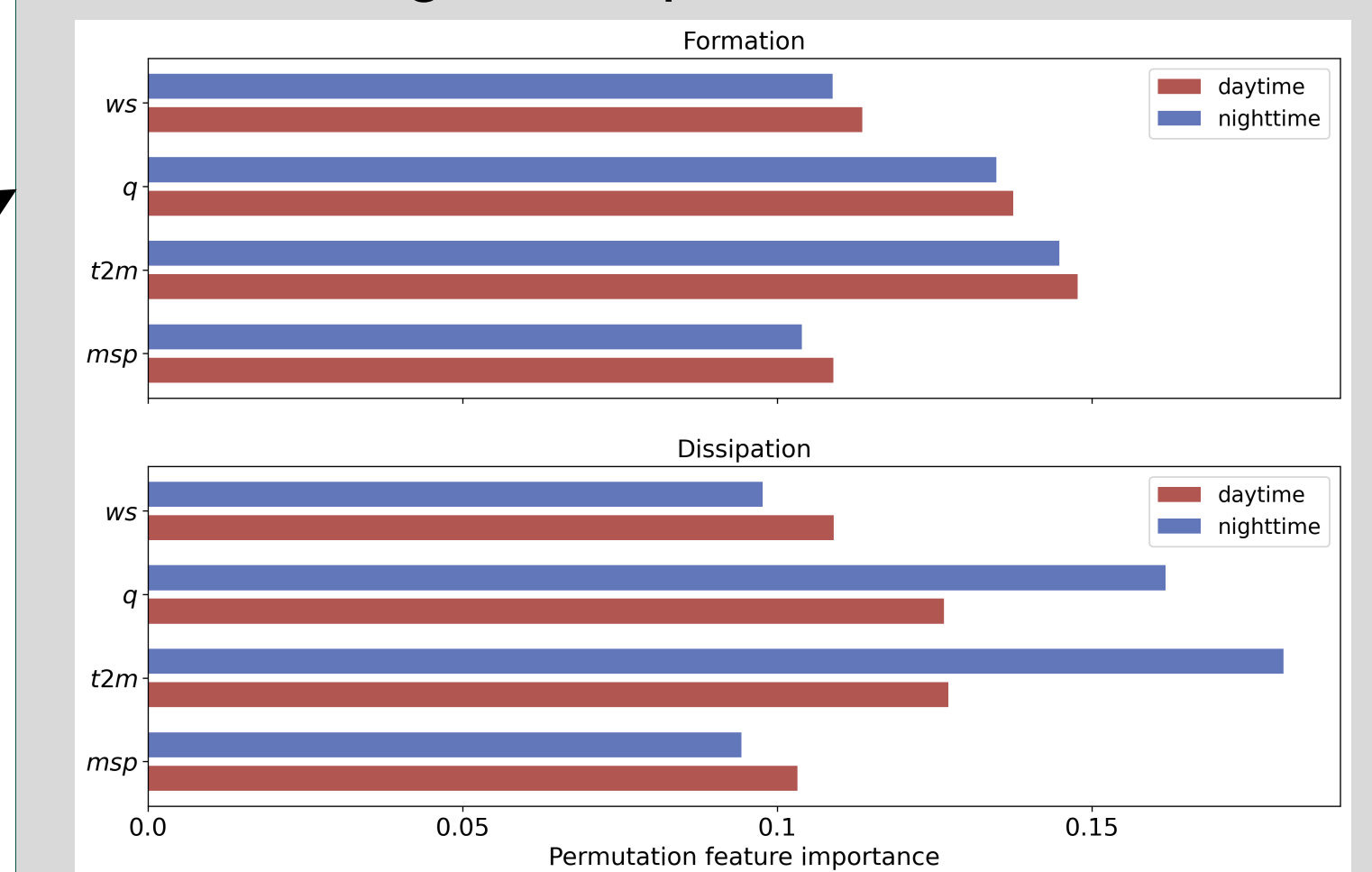


Fig. 4: Permutation feature importance averaged over binary monthly classification models.

CONCLUSIONS & OUTLOOK

- FLS life cycle regimes identified show dependency on geographical setting and climate
- Average FLS life cycle and sensitivities are likely a result of dominating FLS types in regimes
- Regime specific sensitivity studies in the future

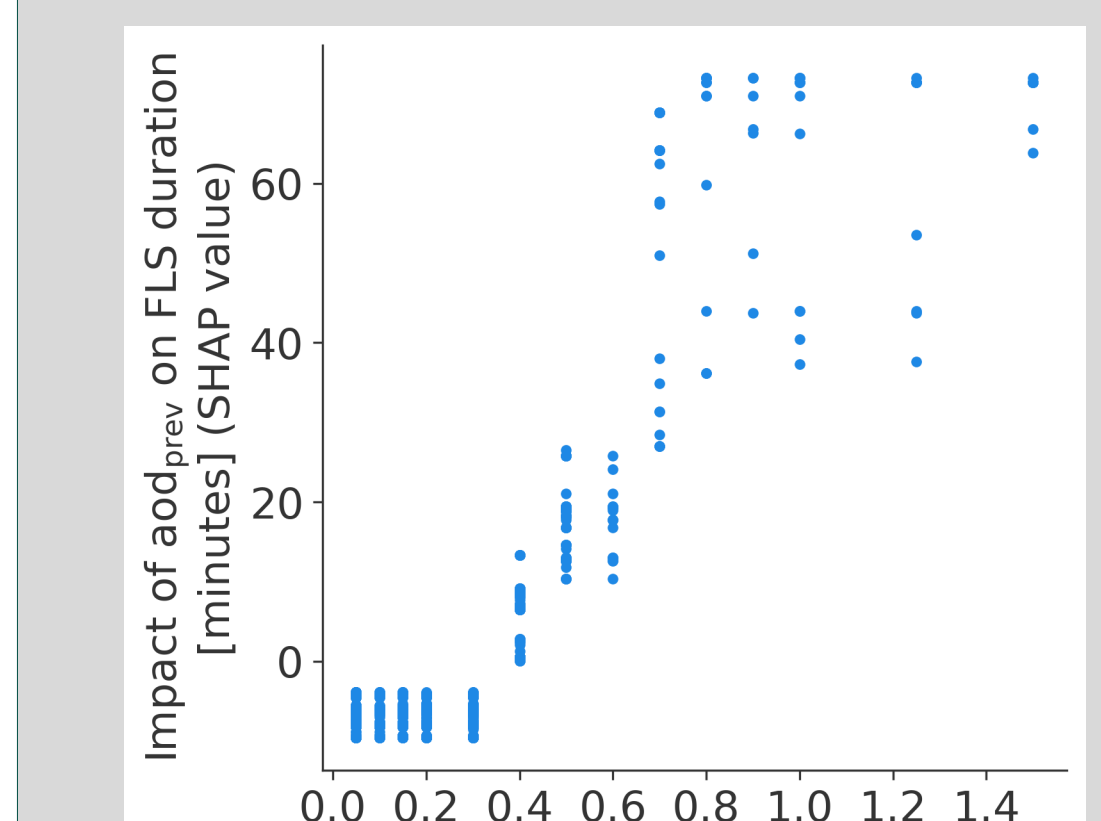


Fig. 4: SHAP values showing the effect of variations in aod on the day before FLS formation on the prediction of FLS duration in the Po valley.