

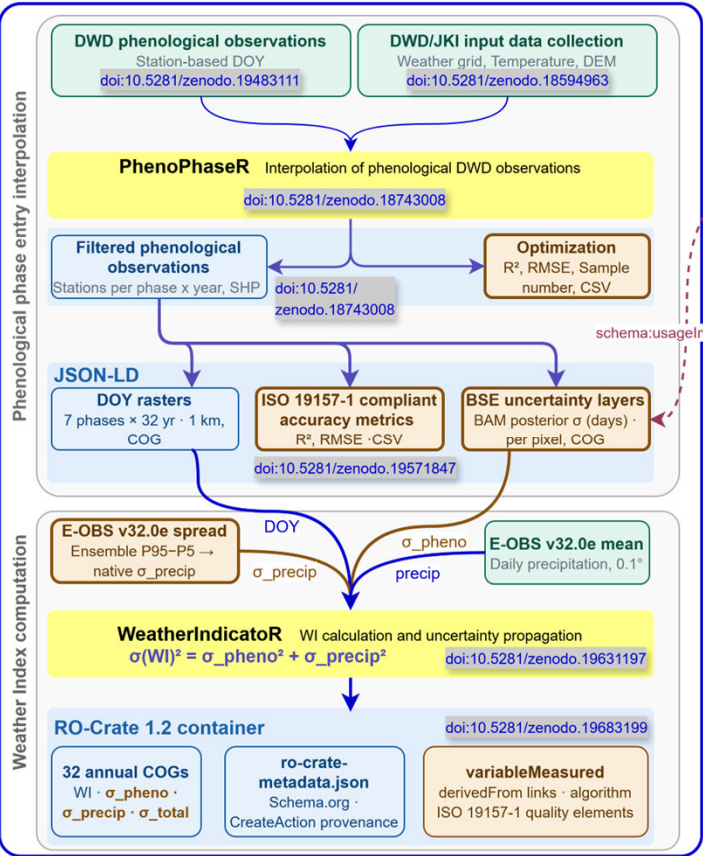
# Enriching Weather Index Metadata for Agricultural Decision Support: Standardized Quality, Uncertainty, and Data-Fitness-for-Purpose Assessment (DFFP)



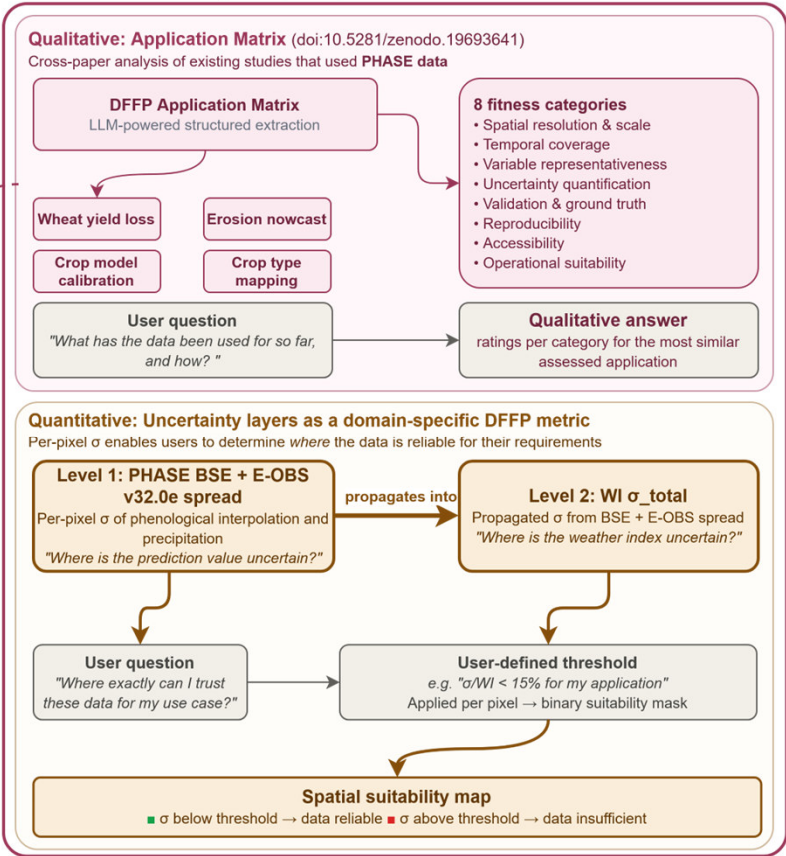
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Agricultural decision support depends on geodata whose data quality (DQ) and data-fitness-for-purpose (DFFP) can be assessed transparently. We demonstrate a workflow that enriches weather index metadata as machine-actionable FAIR Digital Objects published as RO-Crate 1.2 containers on Zenodo. Two independent uncertainty sources are propagated into per-pixel  $1\sigma$  bands co-delivered with every annual product. Three DQ and DFFP metadata components are embedded: (1) ISO 19157-1 accuracy metrics, (2) spatial uncertainty layers for user-defined reliability thresholds, and (3) an LLM-extracted DFFP application matrix documenting validated use contexts. Together, these enable users to ask: "What has the data been used for so far, and how?" and "Where exactly can I trust these data for my use case?"

## Weather Index calculation approach (doi:10.1007/s00704-018-2473-x)



## Data-Fitness-for-Purpose (DFFP) framework (doi:10.1016/j.ecoinf.2026.103660)



## Weather Index and propagated uncertainties

Precipitation sum within the phenological winter wheat phase „shooting“ in 2018 (left) and Uckermark WI time series (right)

Relative uncertainty — WI  $\geq 10$  mm;  $\sigma$ /WI scale capped at 30% | Colour classification: 10-class quantile

