Machine-learned actual Evapotranspiration for an Irrigated Pecan Orchard in NW Mexico

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Irrigated pecan orchard: a wet forest surrounded by dry desert

Pecan orchard from above

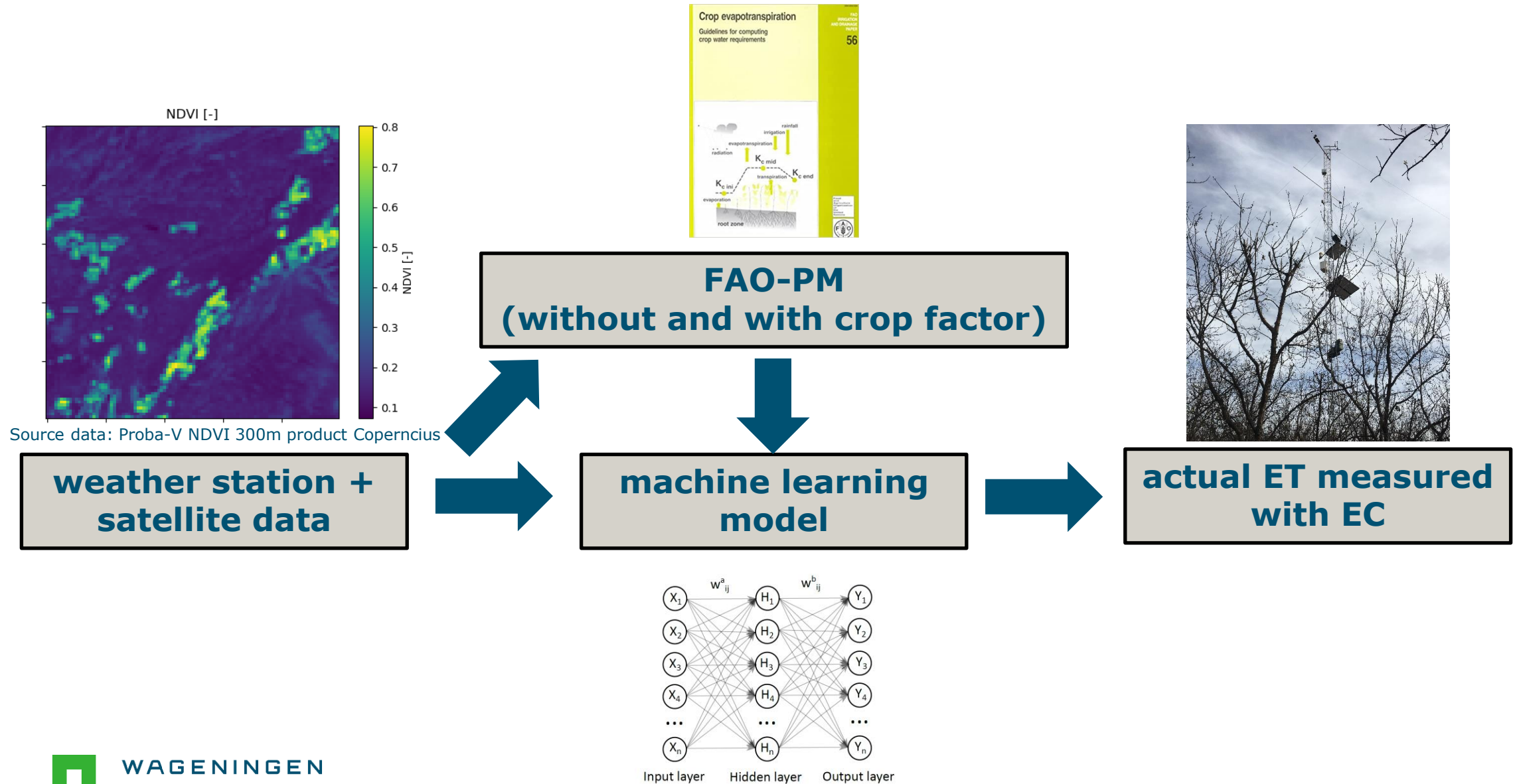Surroundings: desert with scattered irrigated fields
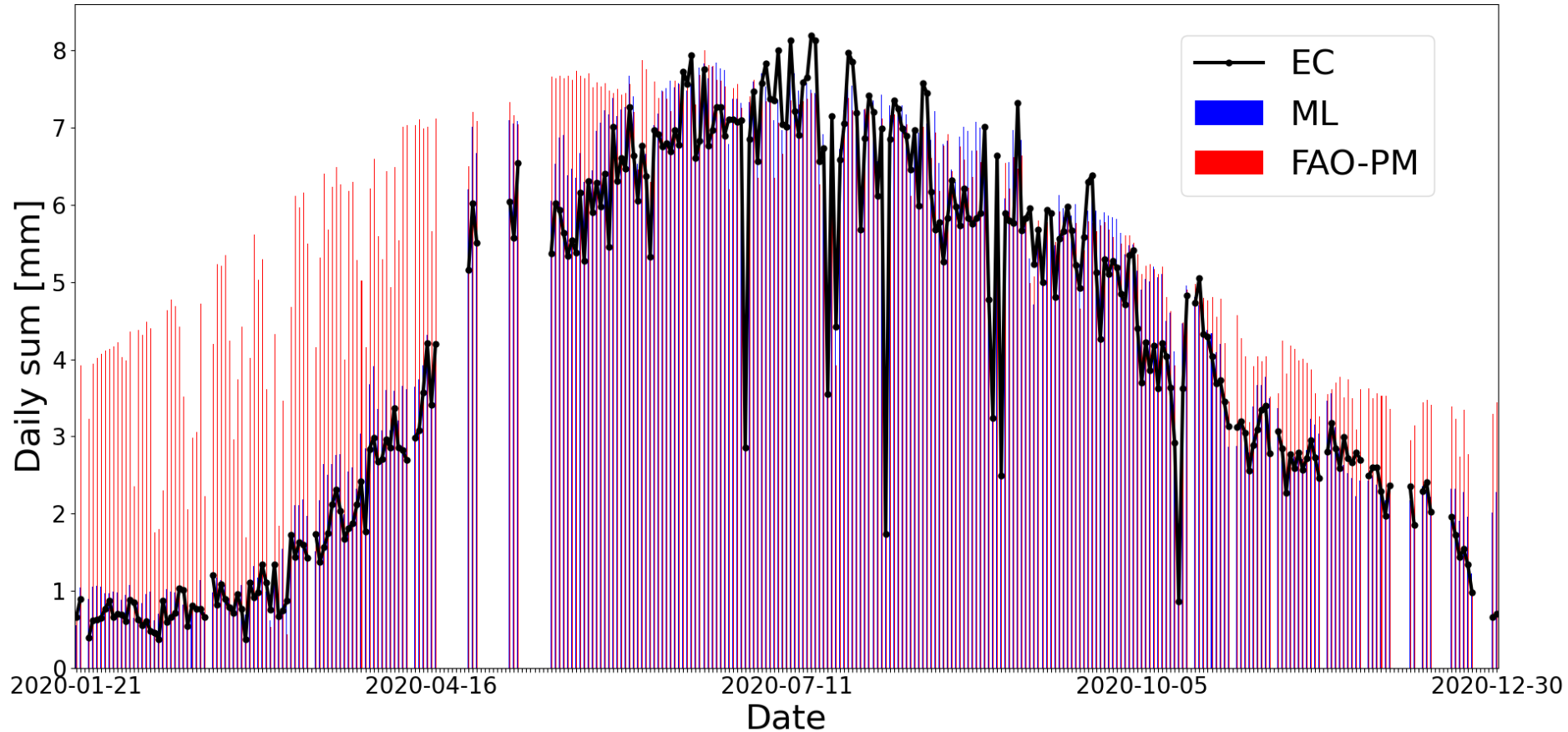
Measurement tower extending above canopy (~12m)

From June 2016 until December 2020 nearly continuous 30min EC-measurements (including ET) available

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Approach: machine learning using only readily available input data and FAO-PM

NDVI [-]

Source data: Proba-V NDVI 300m product Coperncius

weather station + satellite data

FAO-PM (without and with crop factor)

machine learning model

actual ET measured with EC

Input layer   Hidden layer   Output layer

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Result: yearly time scale (independent test year; without crop factor)

Yearly sum ET (mm)

EC: 1256 mm
ML: 1370 mm
FAO-PM: 1656 mm

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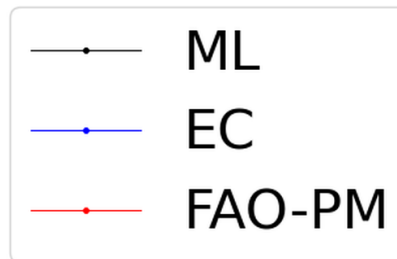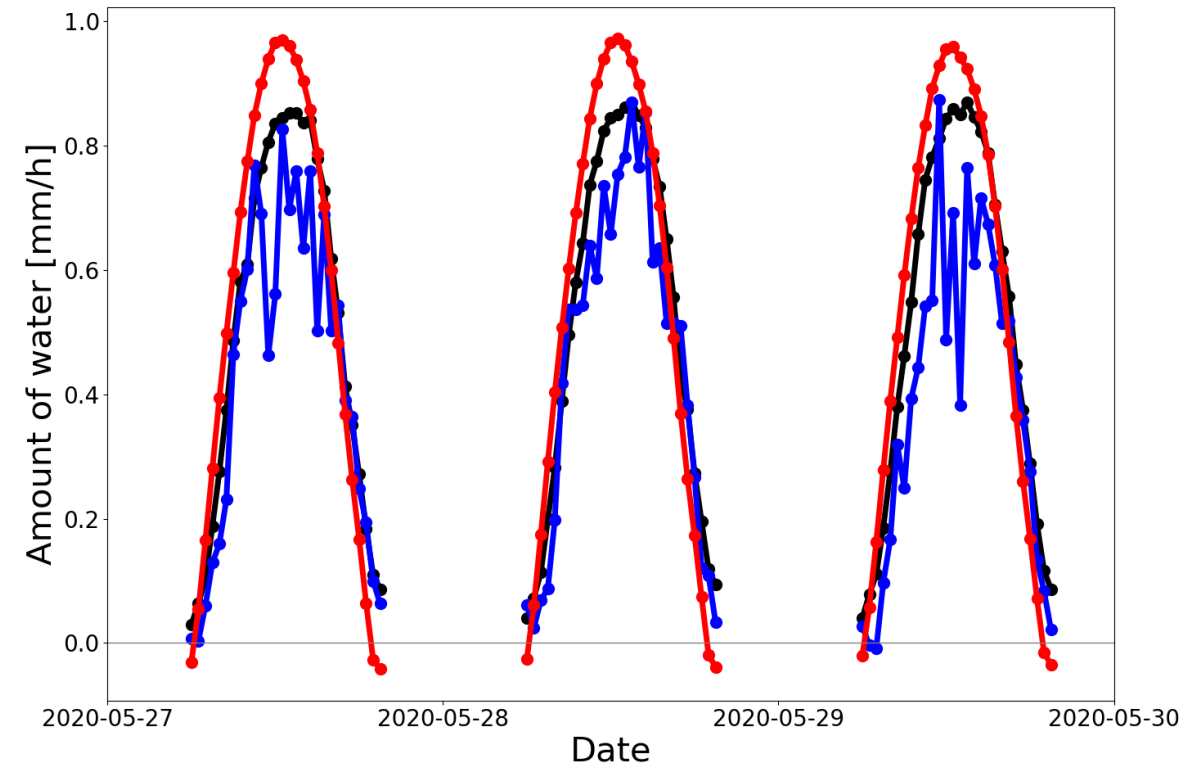
Result: daily time scale (independent test year; without crop factor)

February (outside growing season)
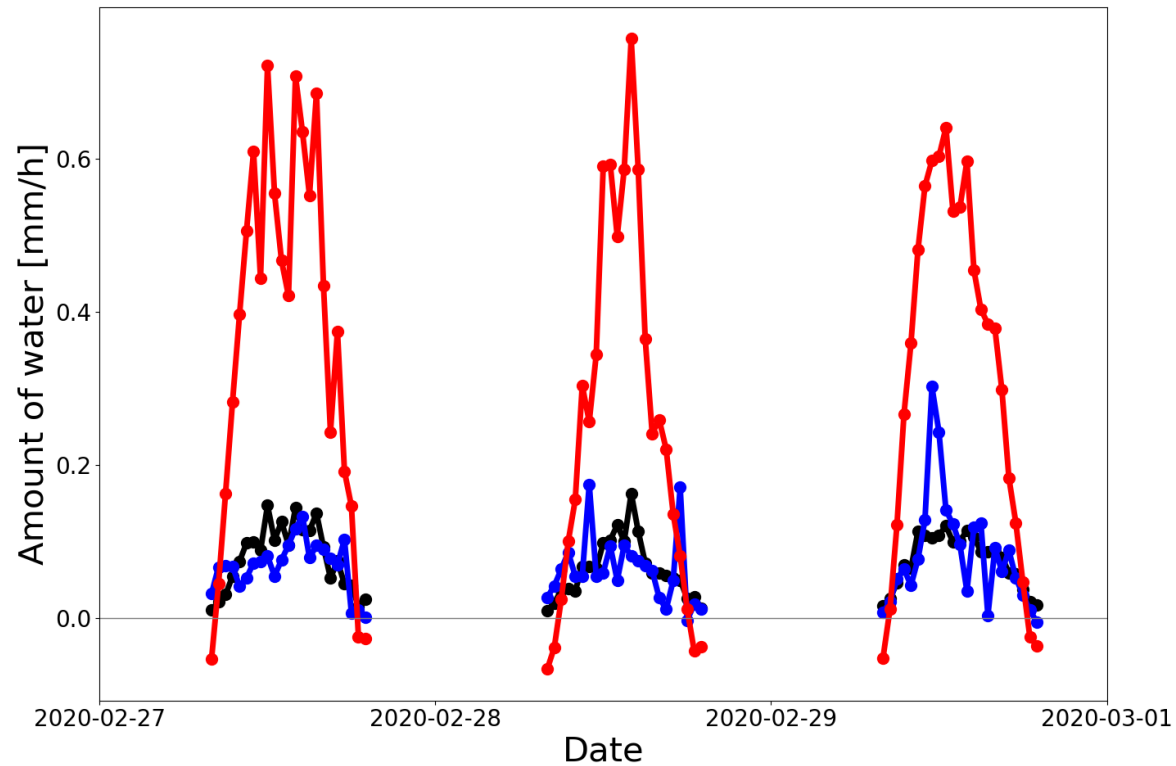
May (within growing season)

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Summary/outlook

- **Objective project**: predict actual ET for an irrigated pecan orchard with machine learning models using weather station + satellite data and FAO-PM

- **Outcome**: machine learning models mostly capable of predicting ET for independent test year

  - Seasonal & daily trend captured

  - 30 min fluctuations more difficult

- **Future challenge**: extend to other irrigated fields in region

  - Train and test on adjacent vineyard

  - Incorporate land-surface models

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