# Mowing detection based on Sentinel-1 and Sentinel-2 data

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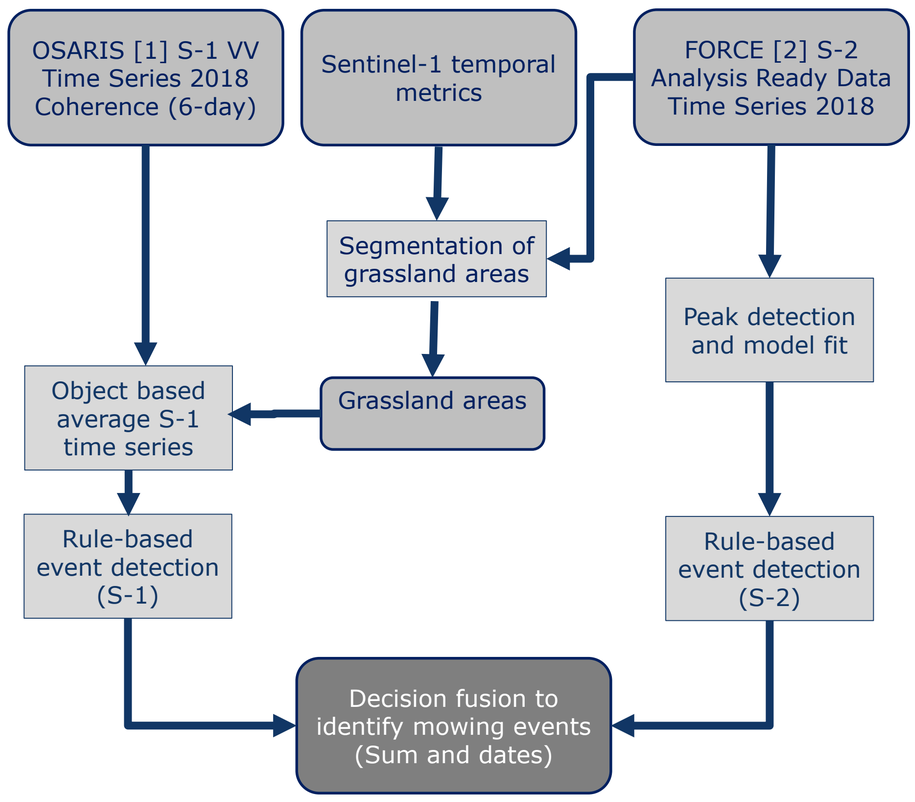
## Background

- Intensively managed grasslands with high mowing frequencies provide a range of important ecosystem services
- Spatially explicit decision support is crucial for environmentally friendly and market-oriented management
- Integrated analysis of optical and SAR data bears potential for improved mowing frequency mapping

## Data & Workflow




- S-2 analysis ready data and S-1 coherence time series as input
- Segmentation of S-1 and S-2 data, to identify areas of homogeneous grassland management
- Object based average to smooth out speckle effects
- Peak (S-2) and valley (S-1) detection
- Rule based decison fusion to identify mowing events
- Approach tested on grasslands in Ramin (northern Germany)

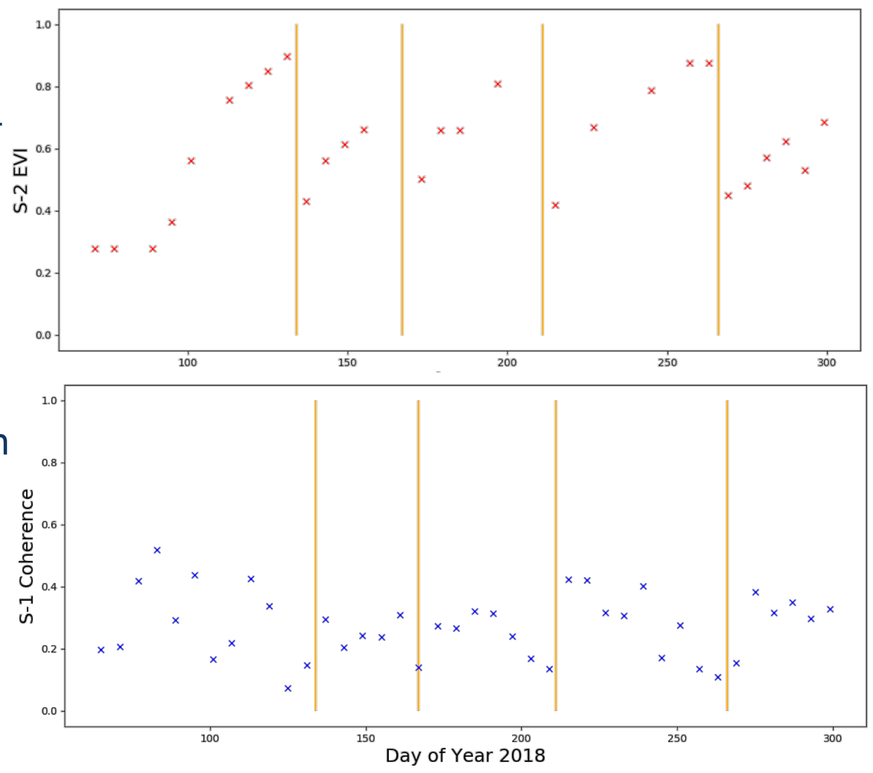



Figure 1: Example of pixelwise S-1 (OSARIS pre-processed) and S-2 (FORCE pre-processed) time series from a grassland plot in Ramin. Yellow lines indicate reported mowing events during the season 2018. S-1 data show high variation on a 20 x 20 m pixel level.

## Results & Discussion

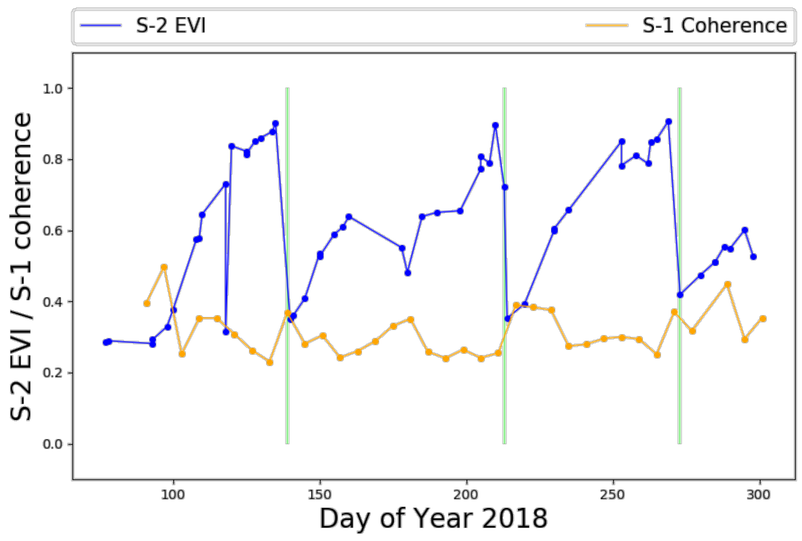



Figure 2: Plotwise S-1 and S-2 time series from a grassland plot in Ramin. Green lines indicate detected mowing events.

- Plotwise management data (e.g., InVeKoS) are not sufficient as reference for mixed use grasslands (e.g., pasture and/or mowing); segments overcome this issue
- Independent peak and valley detection algorithms enable estimating sum and dates of mowing events from S-2 and S-1 time series
- Decision fusion enables to estimate certainty
- Peak/valley omission due to marginal value changes in time series

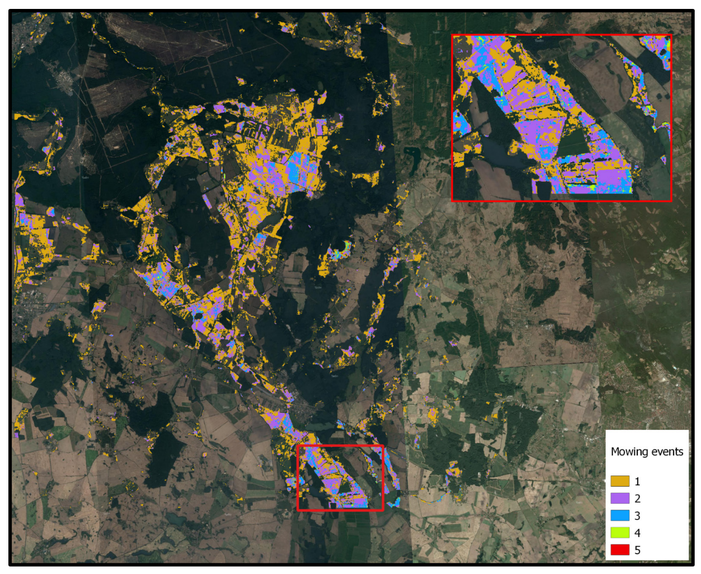



Figure 3: Mowing events detected for segmented grassland areas within one 30 km x 30 km tile. Zoom-in to the Ramin area indicated by the red square. Background: Yandex satellite layer (QGIS-QMS).

- Commission error on pastures → seperation of mowing grasslands and pastures needs to be performed prior mowing detection and should be in the focus of future research

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References:

[1] Loibl, D., Bookhagen, B., & Schneider, C. (2018). OSARIS, a parallelized 'Open Source SAR Investigation System' for high-performance computing environments. In, *EGU General Assembly Conference Abstracts* (p. 15152).

[2] Frantz, D. (2019). FORCE—Landsat + Sentinel-2 Analysis Ready Data and Beyond. *Remote Sensing, 11*, 1124.

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