ML/AI algorithms can provide **more accurate rain flags** for SARAL/AltiKa than the one currently in the product

Detecting rain cells in SARAL/AltiKa data: results from a supervised learning experiment

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Background

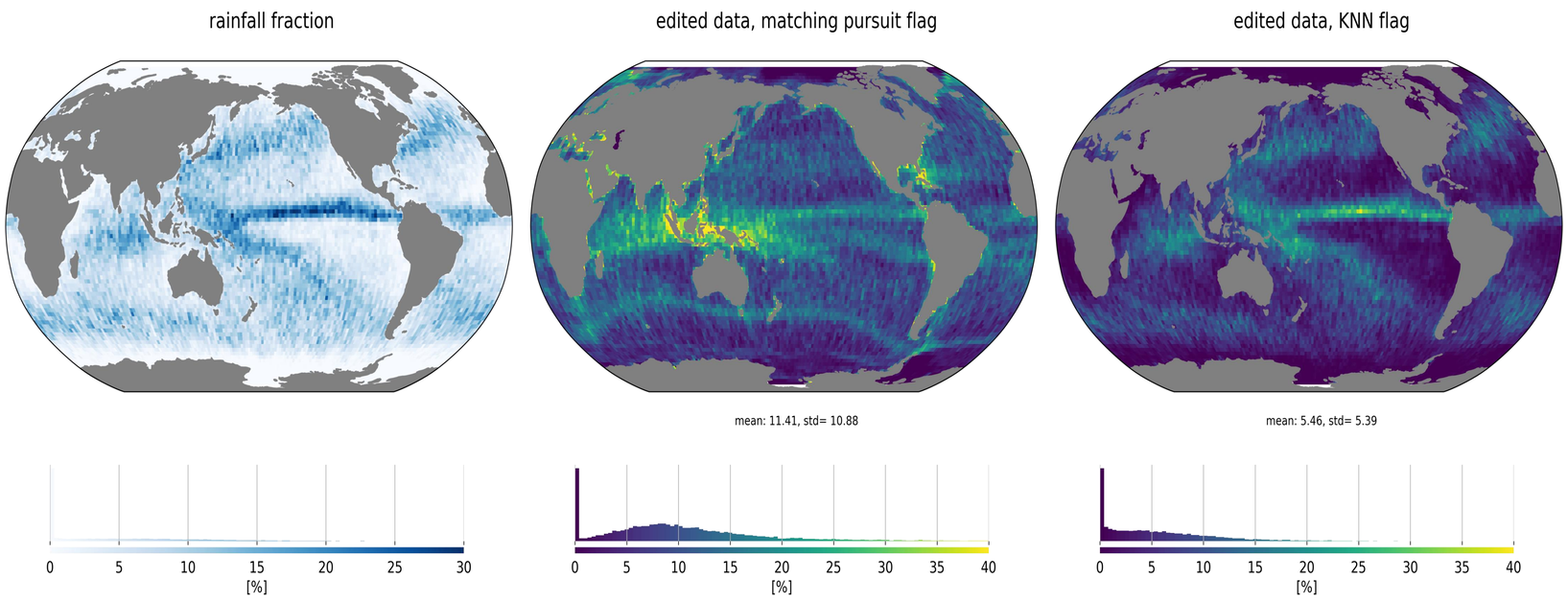
- Ka-band altimetry is more sensitive to the presence of rain cells
- On SARAL, such events are currently detected by a matching pursuit(MP) algorithm (following Tournadre et al.)
- The resulting flag is not super selective as is detects other events (*e.g.* mispointing)

Method

1. Collocate SARAL with SSMI rain rate data (dt < 5 mins)
2. Set rain_flag to True as soon as SSMI rain rate is positive
3. Use this as a training set for different supervised learning algorithms
4. Predict rain flag on independent data
5. Evaluate prediction performance with standard (precision, recall) and Cal/Val metrics (*e.g.* impact on SSHA variance at Xovers)

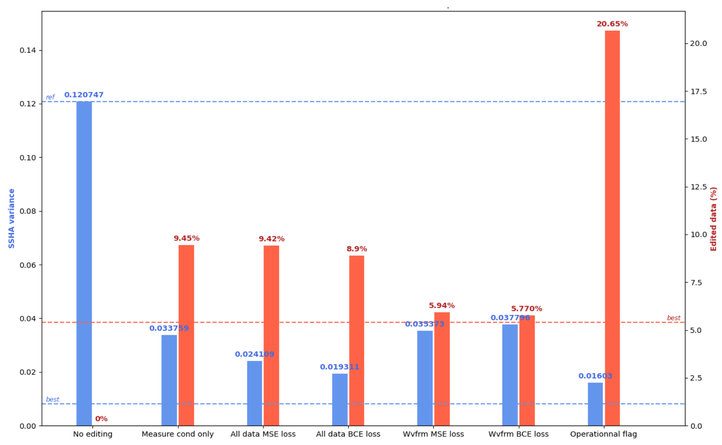
Results @1Hz

- Here we rely on basic ML algorithms (KNN, random forests),
- Features (predictors) include measures of the spread within the 40Hz (*e.g.* std of range)
- We also include radiometer brightness temperatures as features
- Our ML based flags (right) are more accurate at detecting rain events (left) than the MP flag (center) which includes other events (sigma blooms, short scale mispointing variations)



Results @40Hz

- We use waveforms as a predictor and a CNN algorithm
- Some of the classifiers we trained can provide similar performance increase than the MP flag (blue - SSHA variance levels) while editing less data (red bars – percentage of edited data) even when relying on waveforms only



Conclusions

- The precision of even simple models suggests that the two populations (rain/non rain) are easily separable at least at 1Hz,
- This approach could provide improvements to Ka-band altimetry missions,
- This could also be tested on Ku-band altimetry,
- This only applies when a reliable “ground truth” is available to train models

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