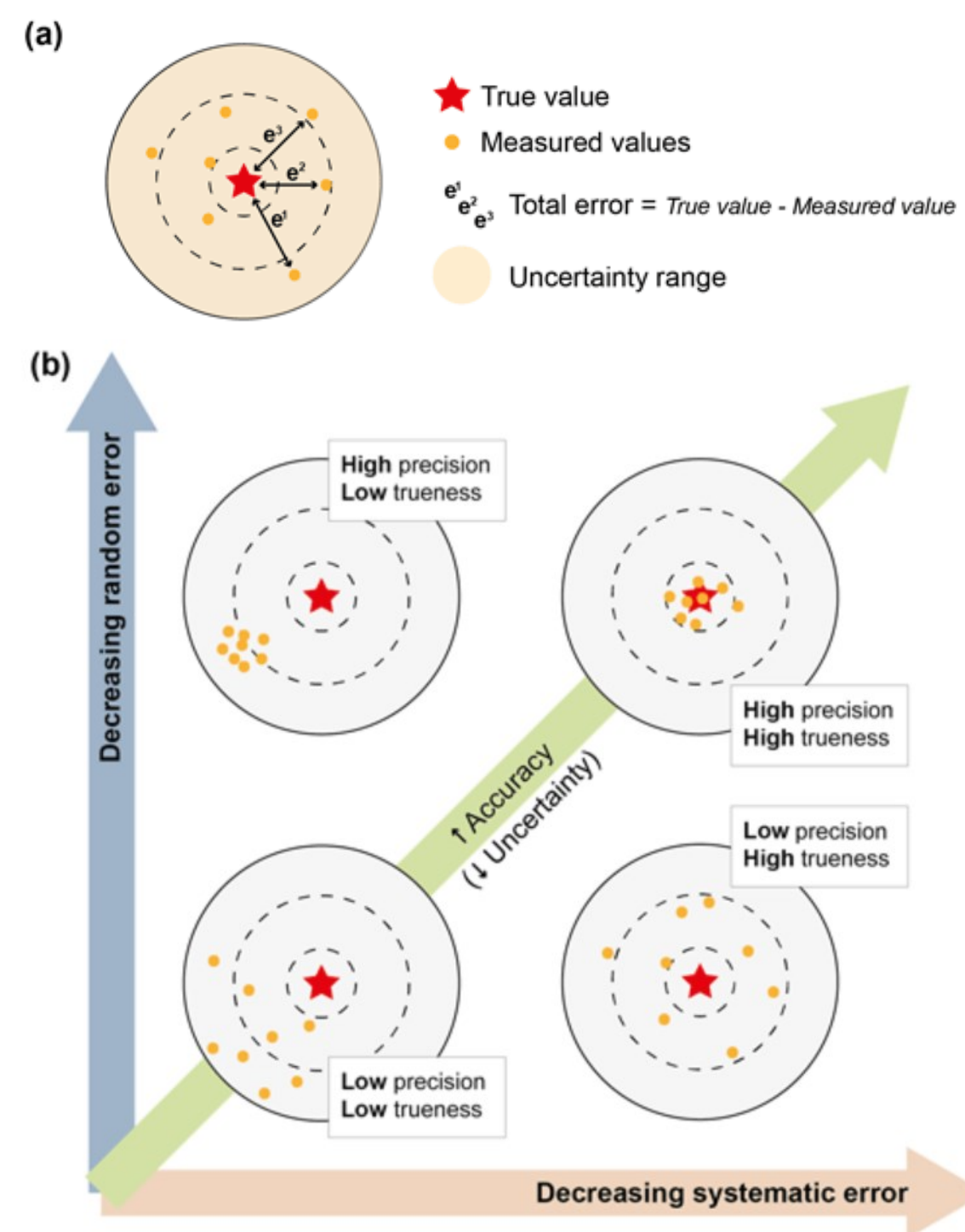


1. INTRODUCTION

Uncertainty in a nutshell



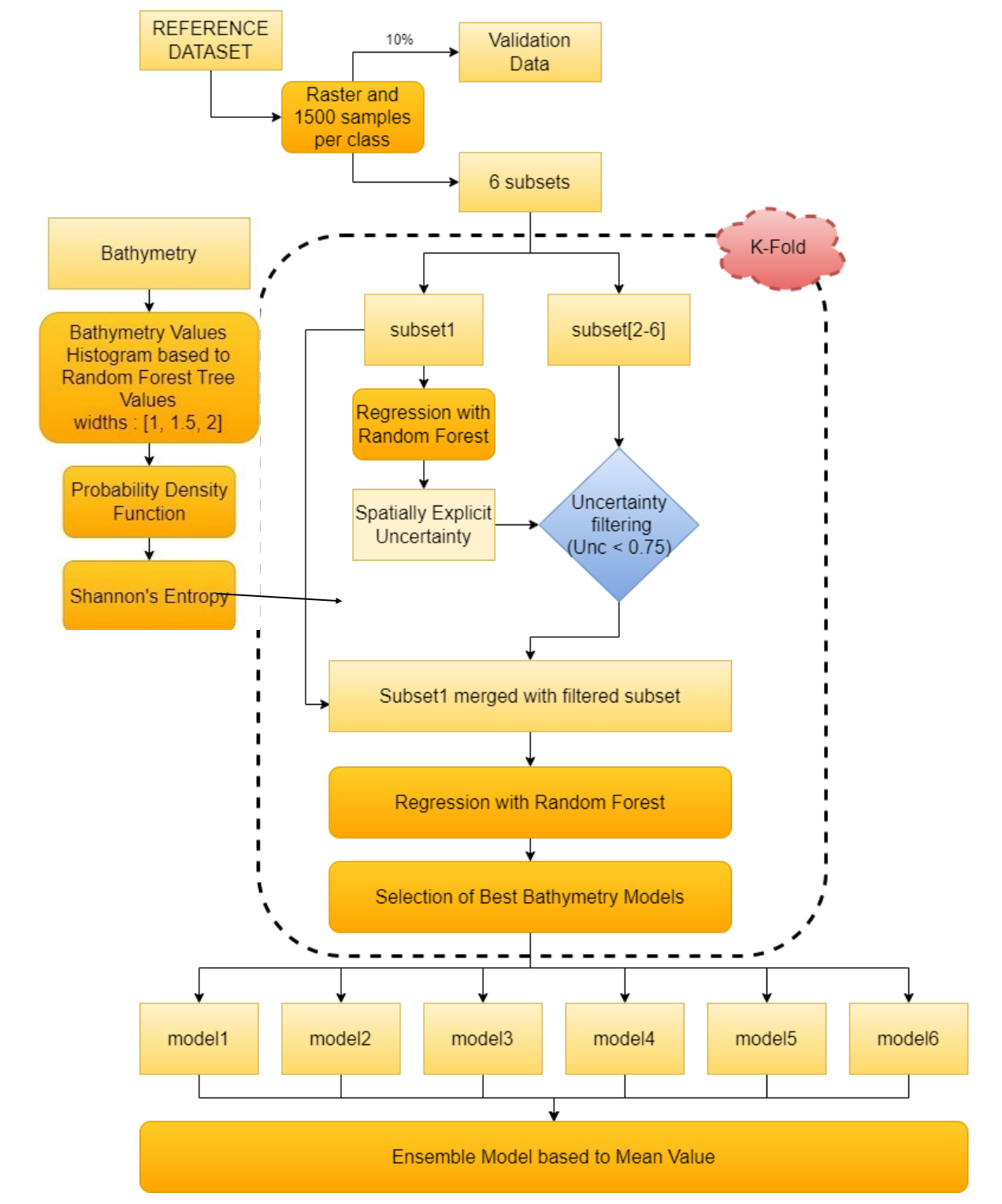
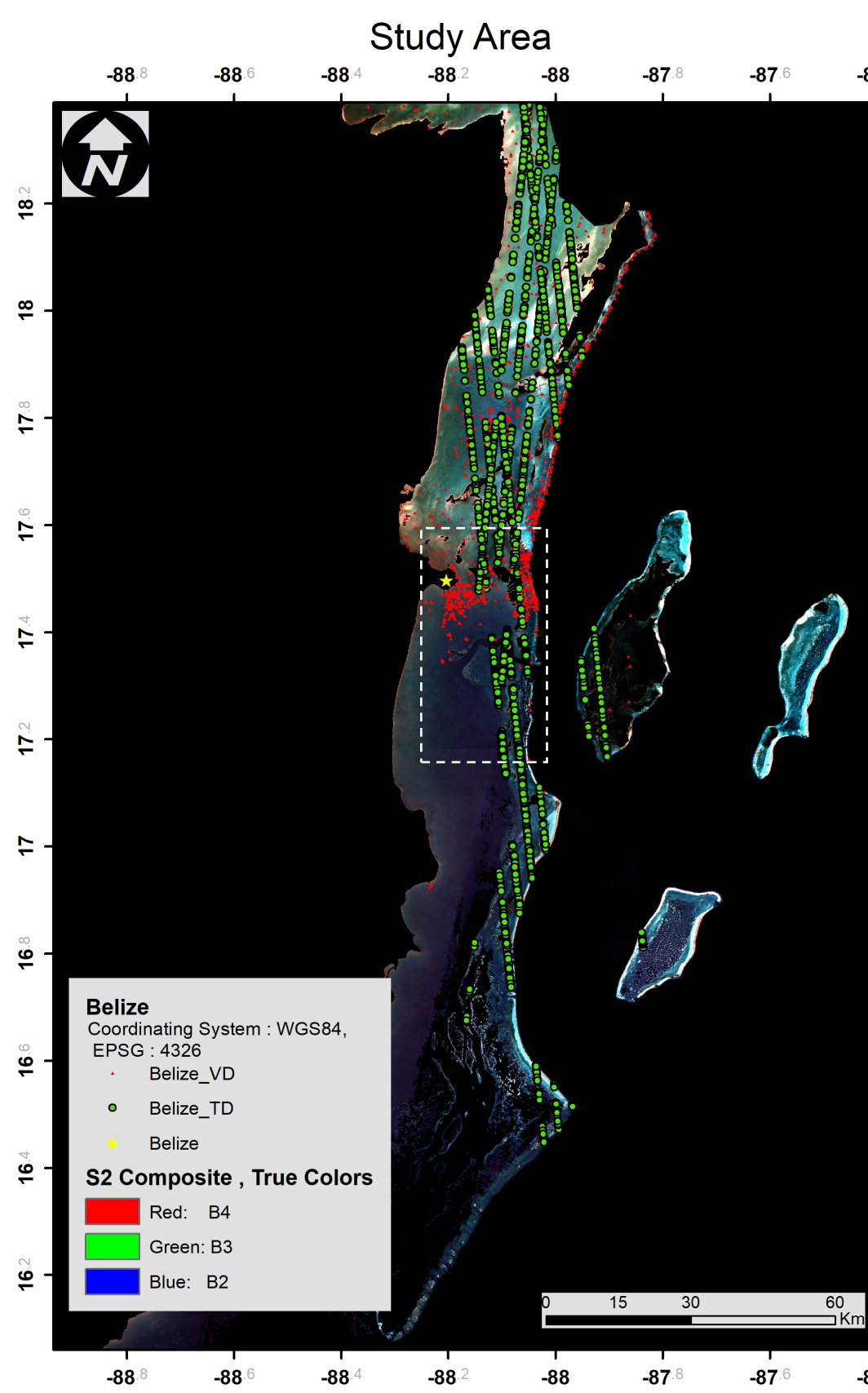
The usage of uncertainty in Cloud-based Remote Sensing

Cloud-based techniques lack information on the spatially explicit uncertainty of Machine Learning products. Despite letting the researcher know which areas might be biased, spatially explicit uncertainty can also orient the researchers to the source of bias.

The goal of the study

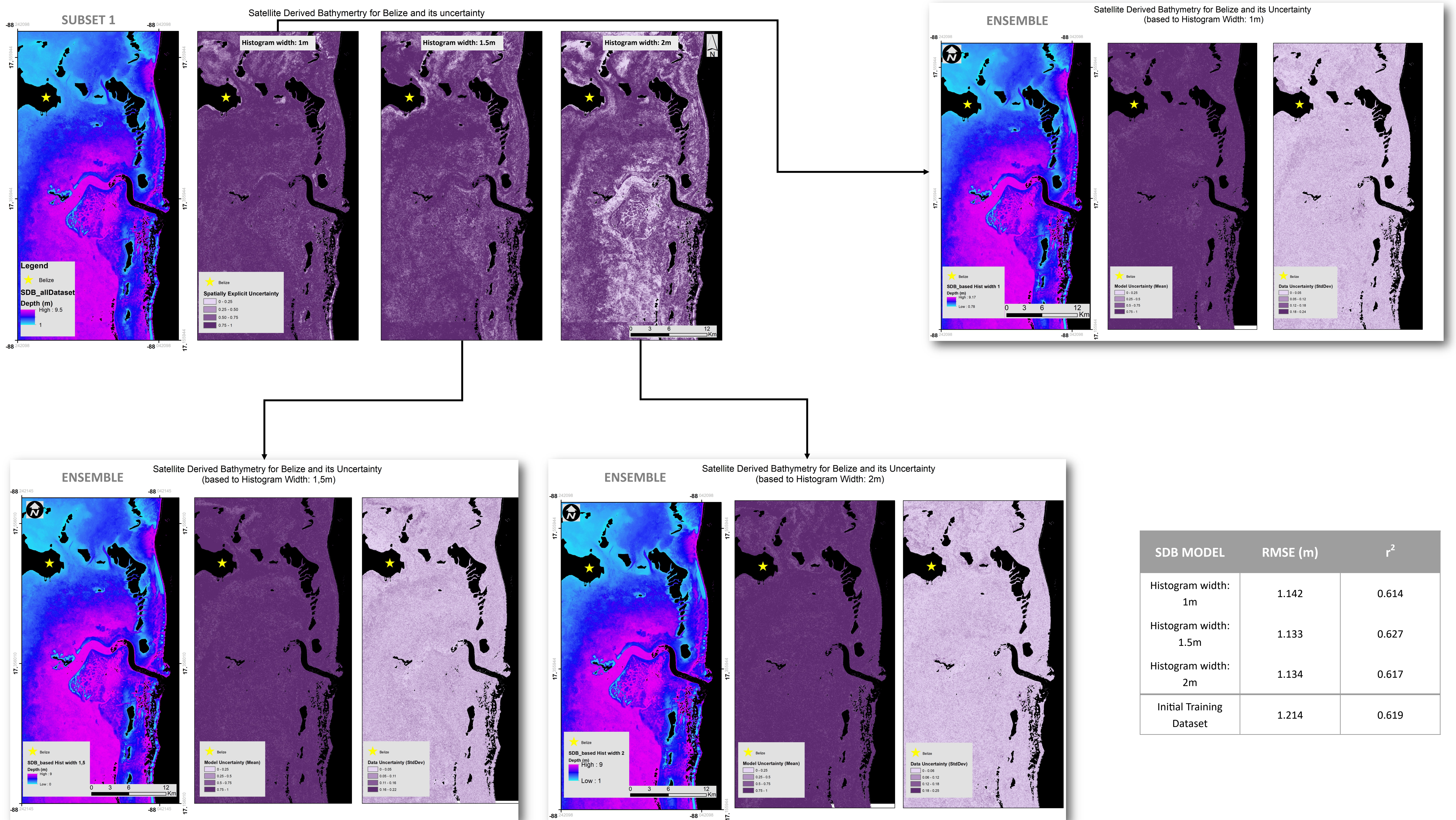
The estimation of uncertainty in a satellite derived bathymetry Random Forest product. Furthermore, we explore the benefits of such information in the context of better regression results through an ensemble model and the visualization of the uncertain areas in an attempt to provide insights on 'hard to model areas'.

2. MATERIALS AND METHODS



STUDY AREA	SATELLITE TYPE	Satellite images	TIME PERIOD	BANDS THAT WERE USED
Belize (Central America)	Sentinel-2, Lvl 2a (10m resolution)	876	Dec 2018 - 2021	['B', 'G', 'R', 'N', 'B_mean', 'B_stdDev', 'B_median', 'G_mean', 'G_stdDev', 'G_median', 'R_mean', 'R_stdDev', 'R_median', 'N_mean', 'N_stdDev', 'N_median']

3. RESULTS



4. DISCUSSION

Spectral signatures who are not represented enough during training tend to have high uncertainty

- The Probability Density Function is highly sensitive to the histogram cluster width during preprocessing
- Majority of the training data belongs to the north tile, therefore in the uncertainty range of 1.5 - 2 m, areas in the south sector of image appear with high uncertainty

Training points with high uncertainty are excluded in a certain point from the regression process

- The high uncertainty of these specific points is justified by their abnormal spectral signatures (turbid waters, sunglind, overlay of satellite footprints etc)
- Minimizes the introduction of bias into the model

5. CONCLUSIONS

- Spatially Explicit Uncertainty seems a promising variable to improve the understanding of remote sensing data, models and applications
- Spatially Explicit Uncertainty is able to provide policy makers with crucial information regarding the extent, the condition and the conditions that compile the parameter under investigation. On top of that, its usage as a tool to distinguish easy and hard to model areas can be mitigate to other continuous distribution ML products like sea surface temperature, abnormality detection or even blue carbon accounting

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