j.phillips5@lancaster.ac.uk
linkedin.com/in/joe-b-phillips
github.com/joe-phillips

Retrieval of Ice Sheet Topography from Radar Altimetry Waveforms using Deep Learning

Joe Phillips[1,2,3] Malcolm McMillan[1,2,3]

[1] Lancaster University, UK [2] UK Centre of Excellence in Environmental Data Science [3] Centre for Polar Observation and Modelling

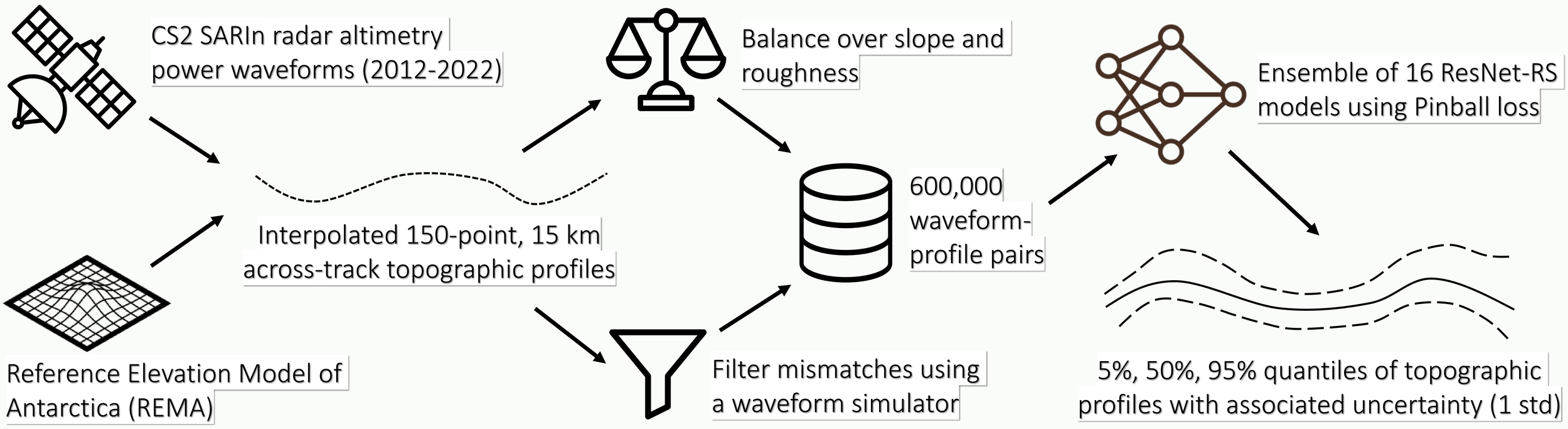
① Context

Satellite radar altimetry provides a crucial long-term record of ice sheet changes, but single-antenna measurements suffer from ambiguity in the origin of surface reflections.

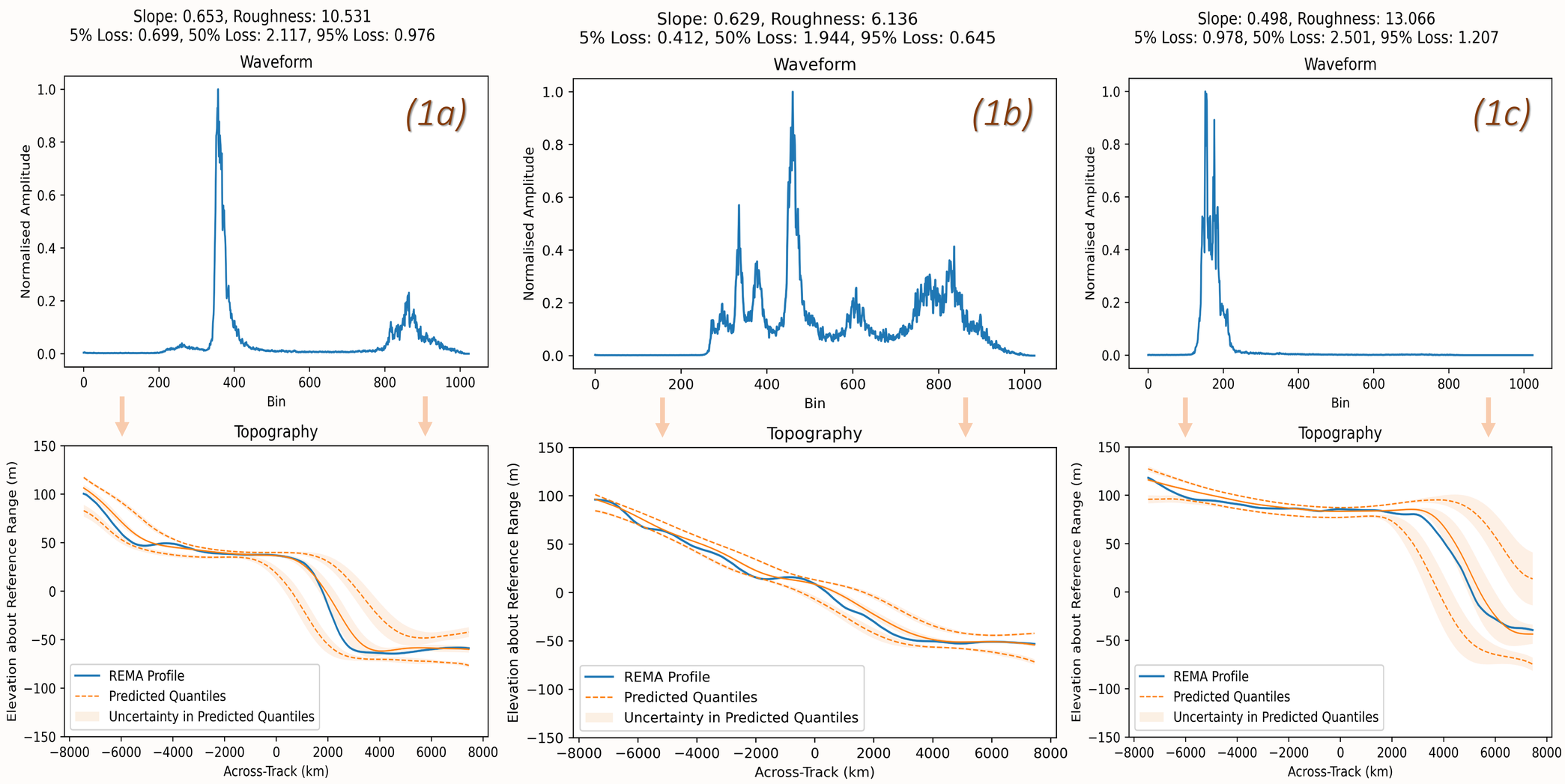
Standard Level-2 processing chains aim to overcome this through techniques like slope correction and retracking. However, these methods tend to offer degraded performance over complex terrain and extract limited information from waveforms, typically a single elevation at the point of closest approach.

This study leverages deep learning to learn the full, underlying, across-track topographic distribution of possible surfaces within the satellite footprint, using solely CryoSat-2 (CS2) SARIn radar altimetry power waveforms.

② Methodology



③ Preliminary Results



We evaluate the trained ensemble using waveforms from Pine Island, which was excluded from training (e.g. Figures 1a-c)

Provides high-resolution surface distributions that consistently capture the true topography

Can help assist current processing chains in better and more robust elevation retrieval