Examining the nexus of policy, climate physics, and maritime shipping with deep learning

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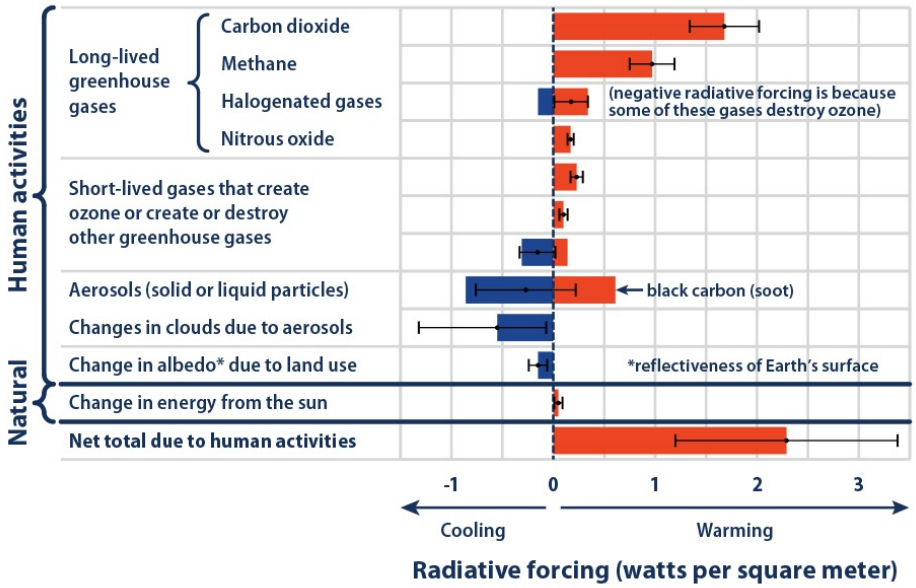
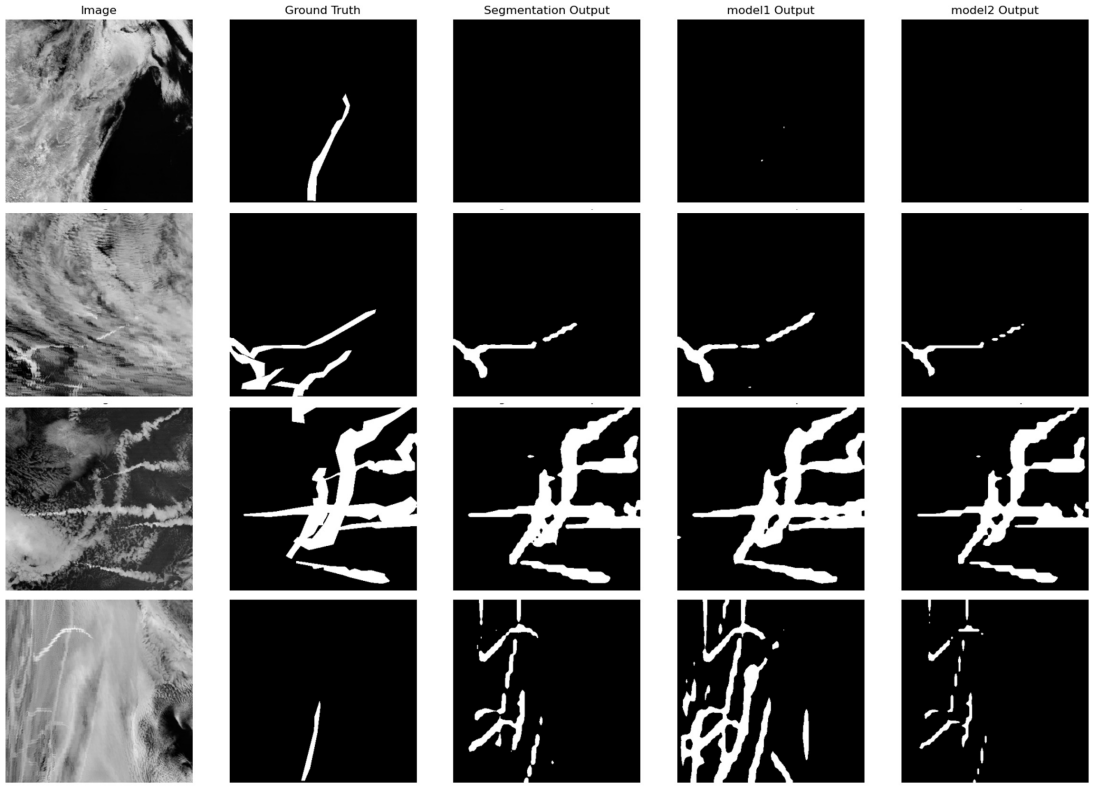
Introduction



The largest uncertainty of anthropogenic climate forcing is the term 'changes in clouds due to aerosols', i.e. cloud changes due to pollution particles if said in plain English.

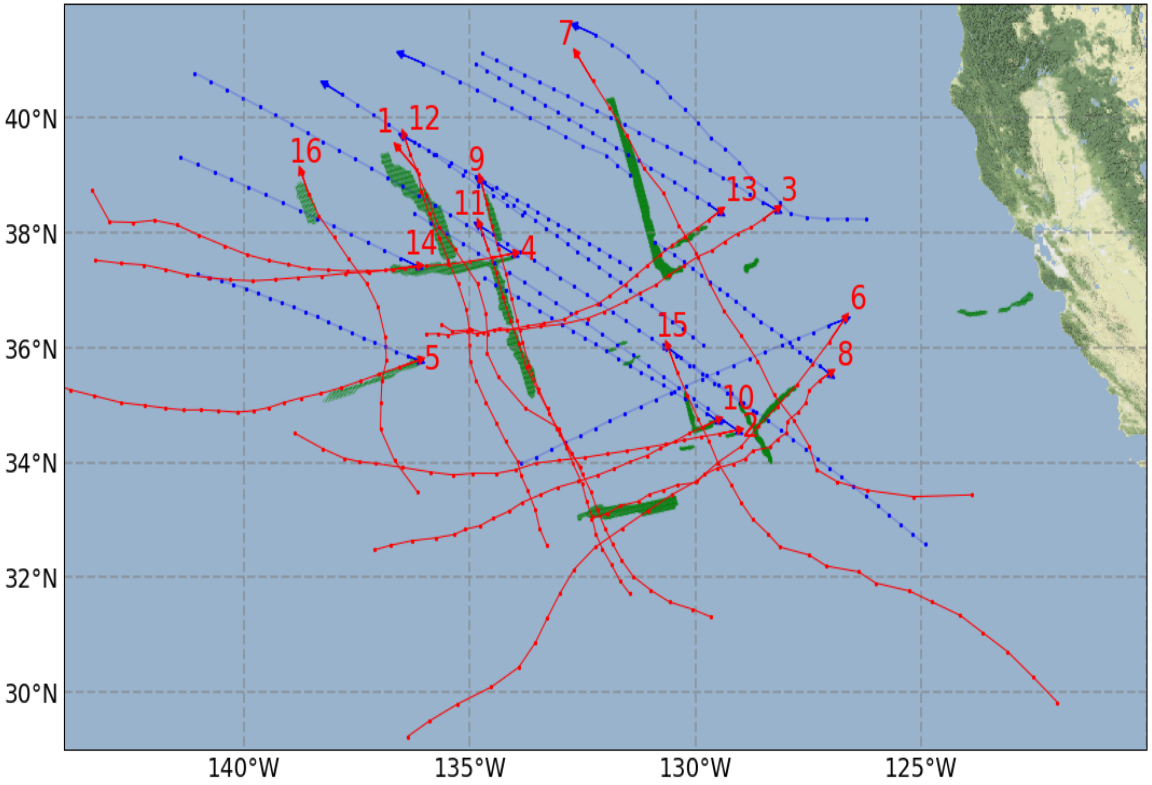
Ship-tracks are produced by particles from ship exhaust and they clearly change cloud brightness as shown in this example. They are the best laboratories to study the climate forcing due to aerosol mediated cloud changes. Thus, our focus here.

Model performance



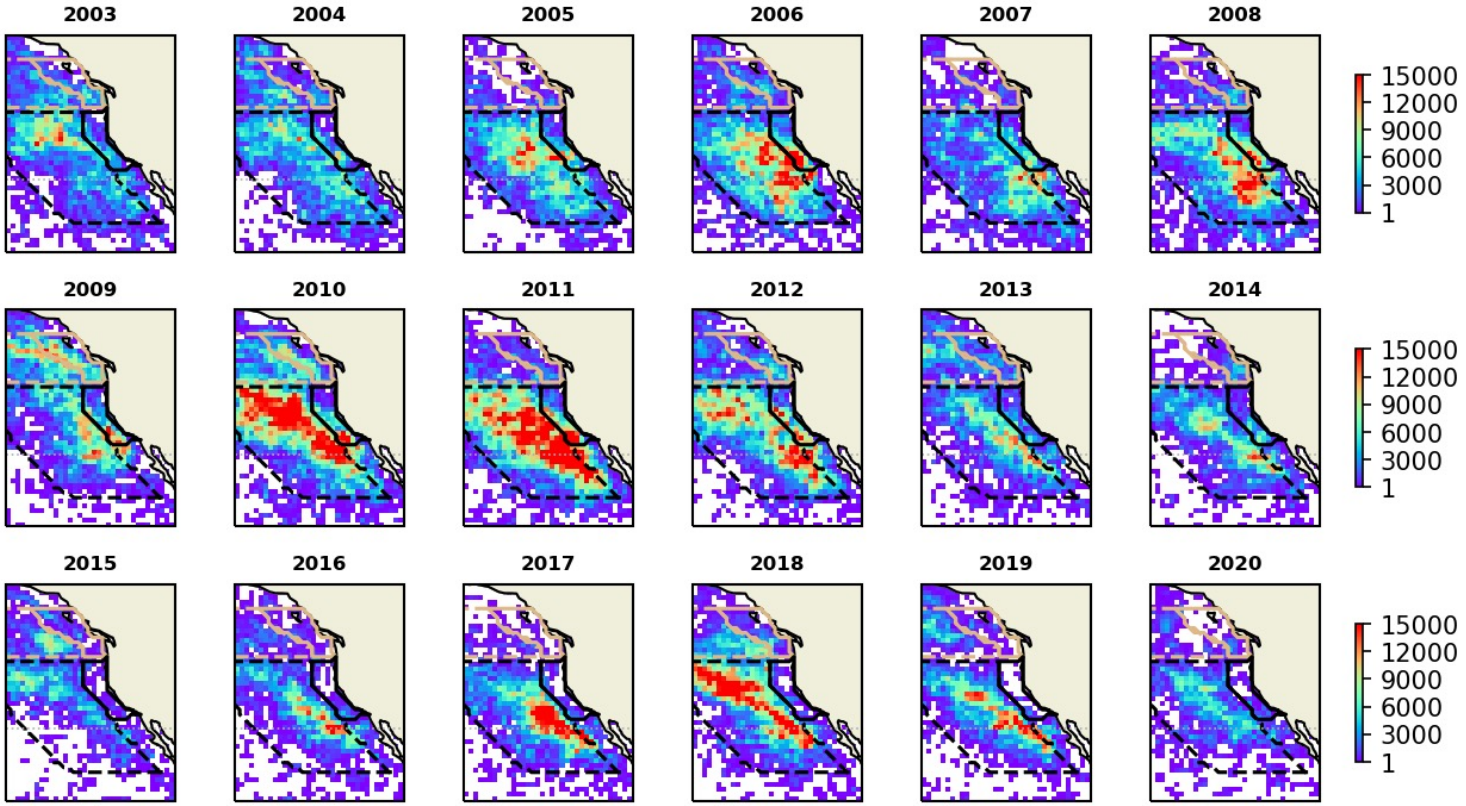
Four examples of (left)MODIS 2.1um images, (second to the left) manually labelled ship track masks (white pixels), (middle) ship track masks from an ensemble of models, (right two) ship track masks from two models.

Validation strategy



We validate our prediction based on forward trajectory model predictions of expected ship tracks (red lines) based on wind data and GPS-based ship location data (blue). Our model detected ship-tracks are in green.

Detect impact of policy



Understanding climate physics