A human-labeled Landsat-8 contrails dataset

Kevin McCloskey [*][1]   **Scott Geraedts** [*][1]   **Brendan Jackman** [1]   **Vincent R. Meijer** [2]   **Erica Brand** [1]   **Dave Fork** [1]
John C. Platt [1]   **Carl Elkin** [1]   **Christopher Van Arsdale** [1]

[*] Equal contribution
[1] Google
[2] Laboratory for Aviation and the Environment, MIT
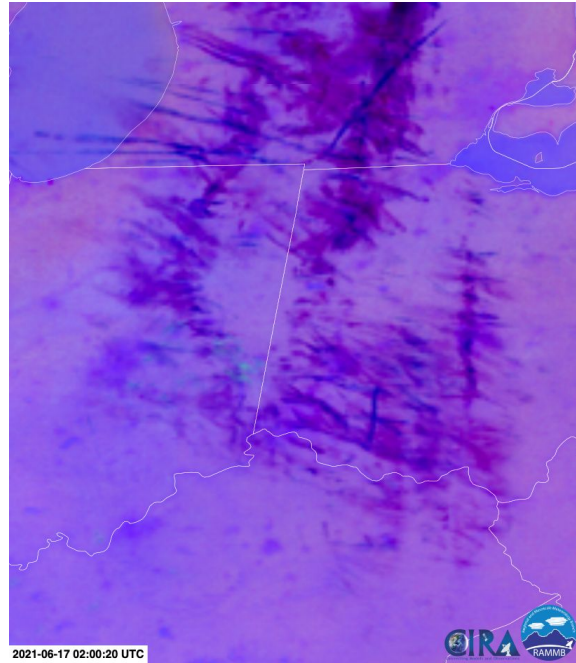
Contrails (condensation trails) are anthropogenic clouds

Contrails (condensation trails) are anthropogenic clouds

GOES-16 data rendered by
https://rammb-slider.cira.colostate.edu/

Contrails likely cause more than half of aviation's warming

Data from Lee et al 2021, Atmospheric Environment
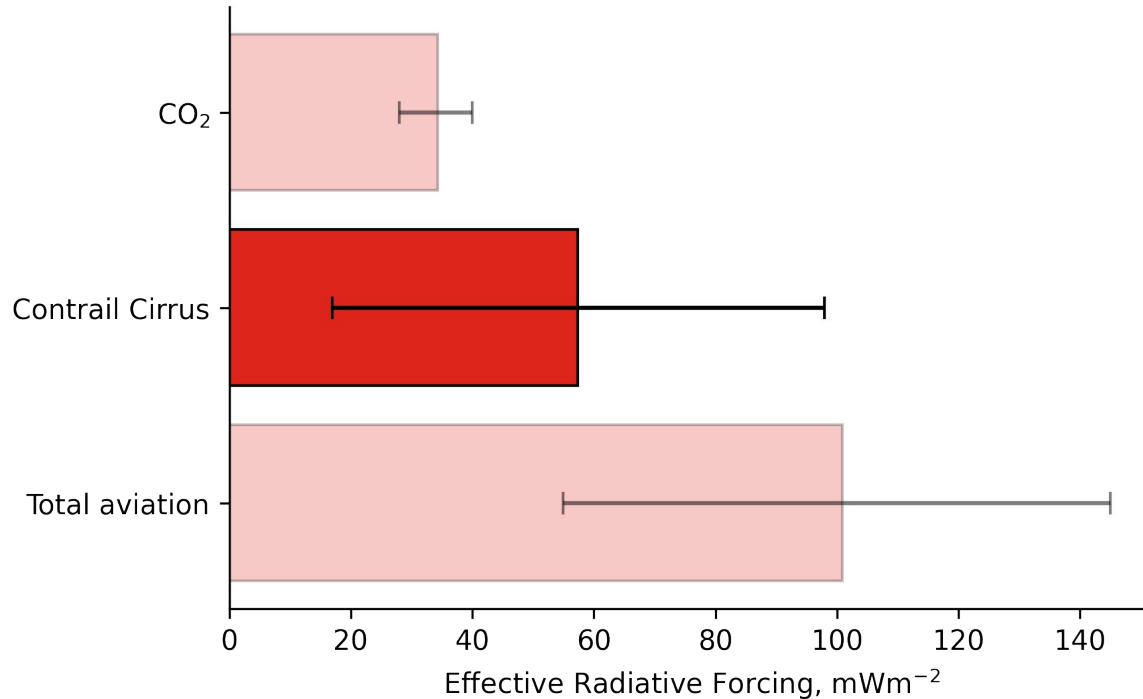
Small flight diversions may mitigate most of this warming
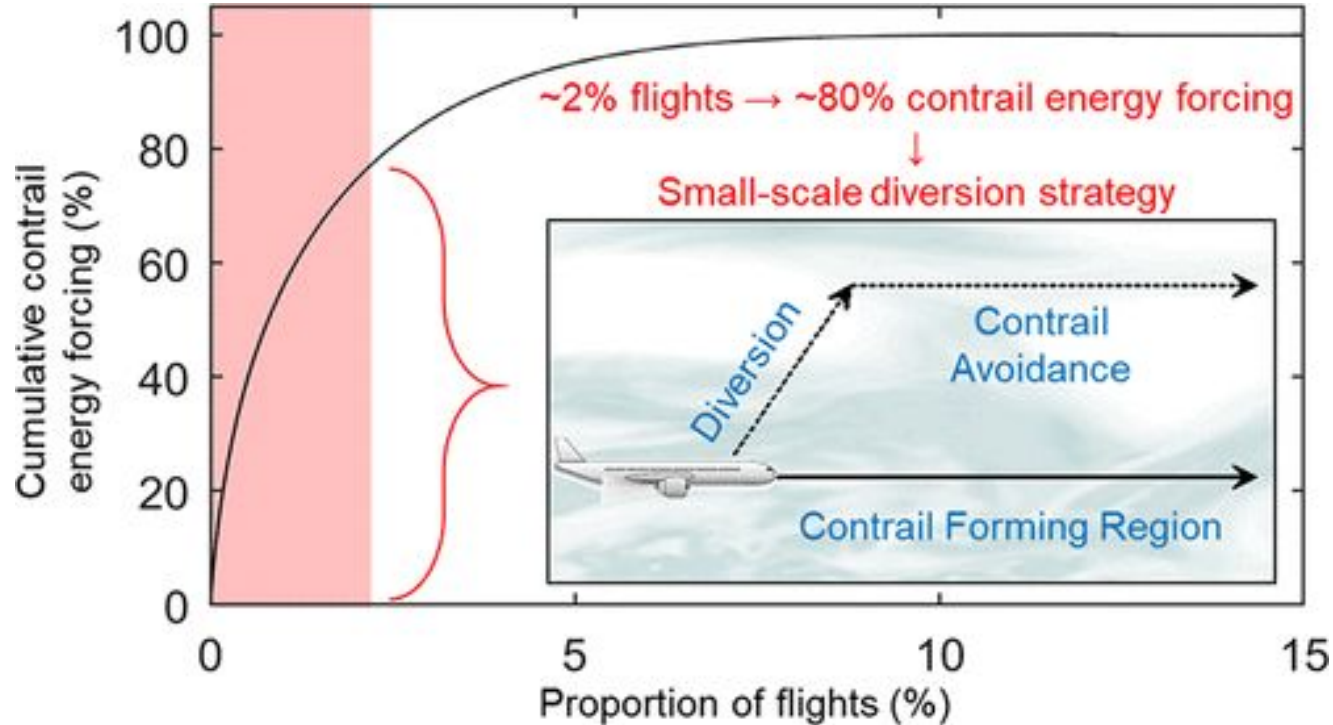
Satellite Contrail Detection is foundational

High accuracy is needed for:

● Evaluating contrail prediction models

● Tracking contrails as they evolve (thus measuring net warming impact)

● Verifying flight diversion effectiveness

Contrail remote sensing is ripe for ML - but labels are needed

Mannstein et al, 1999 has been state of the art in Satellite Contrail Detection.
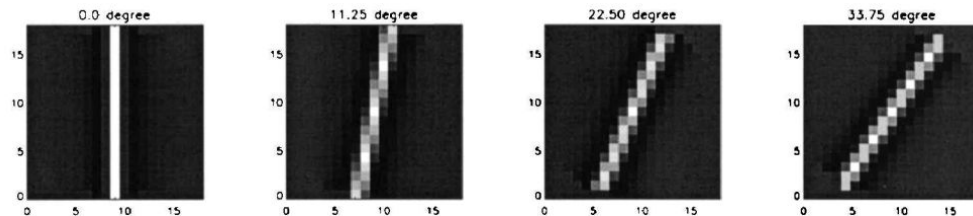- Hand engineered algorithm with ~10 tunable parameters
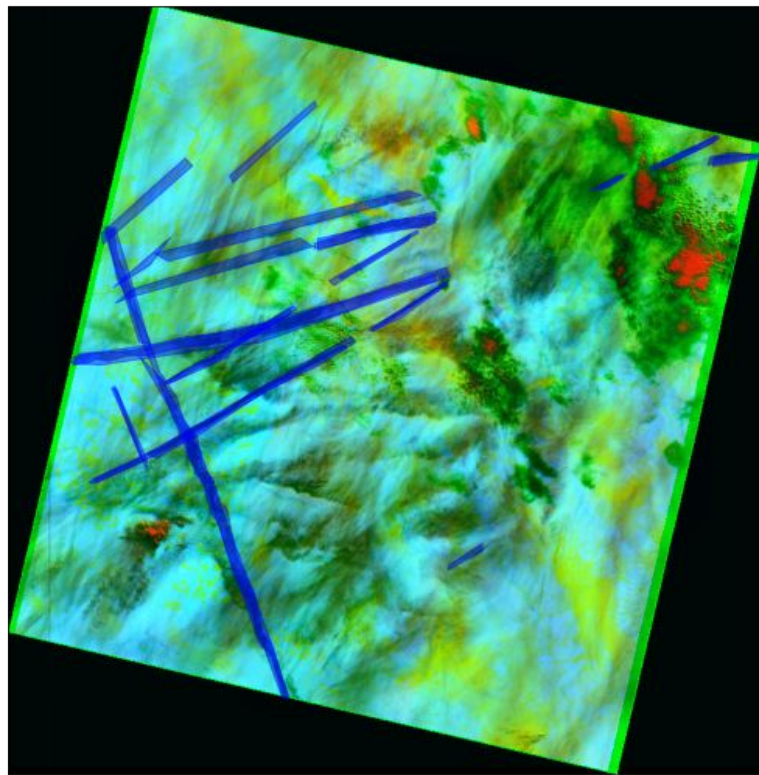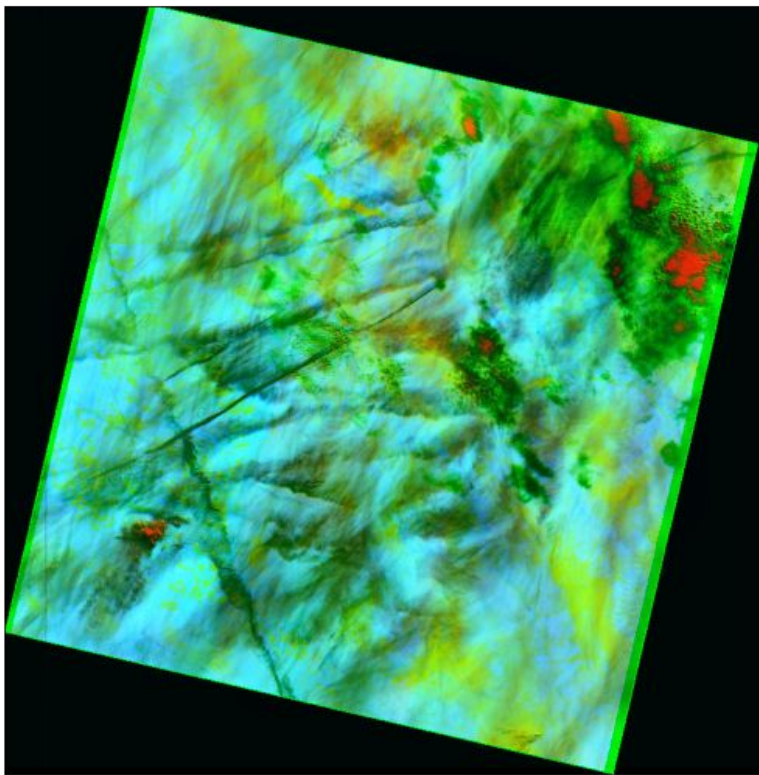
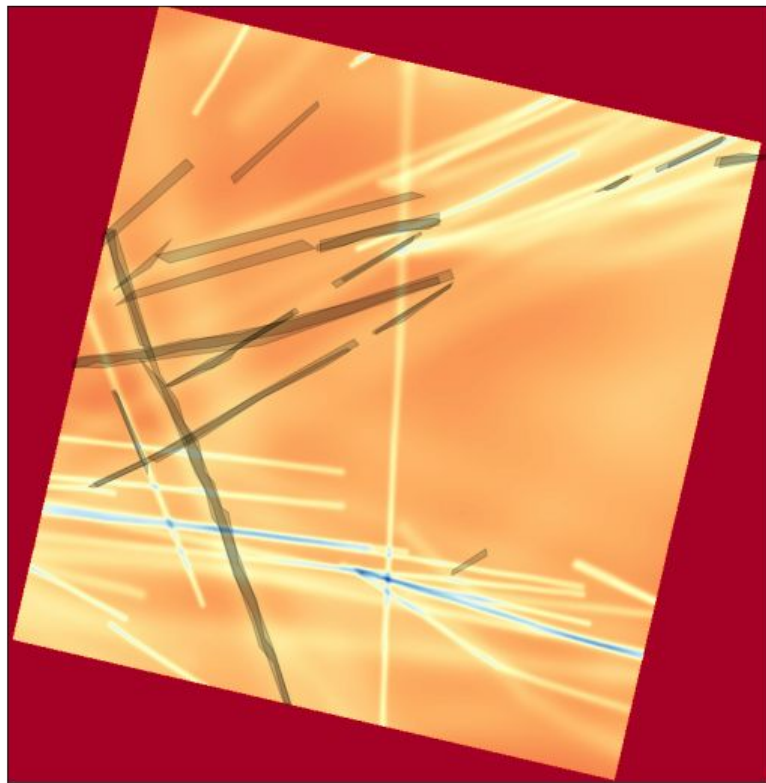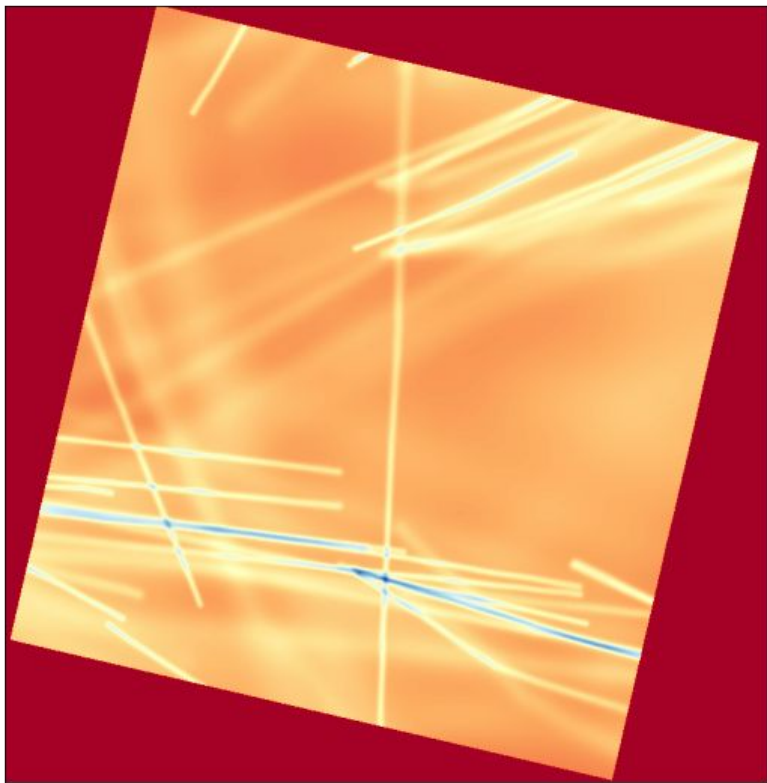Figure 6.   Example of the first four kernels for line filtering.

Only aware of one deep learning publication: Kulik, 2019/Meijer et al 2021 (under review)
- They created a labeled dataset on GOES-16 imagery
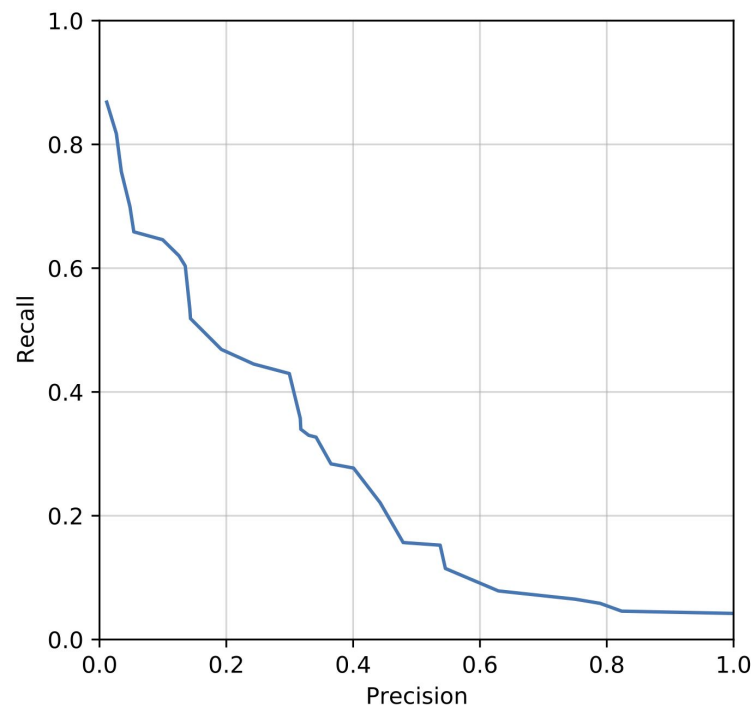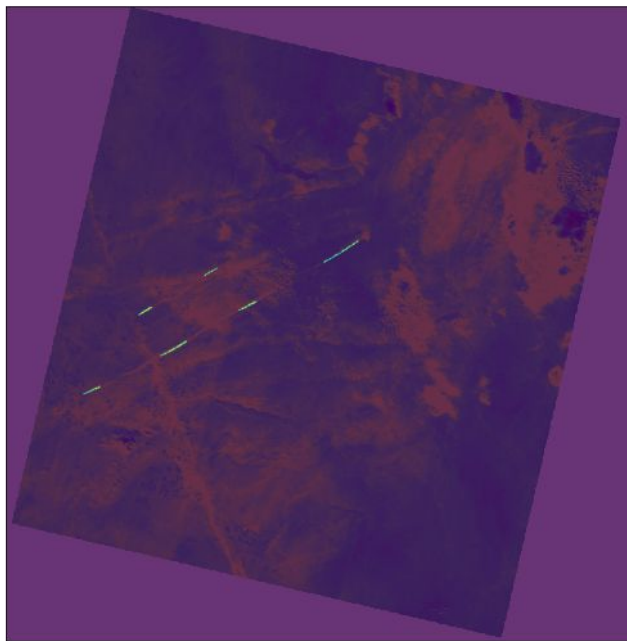
Our Landsat-8 contrails dataset

Advected flights feature

Baseline performance for contrail detection in our dataset

Mannstein et al 1999 algorithm

Other possible uses for the dataset

- Validating high confidence subsets of GOES-16 detections

- training data for super-resolution models focused on contrail remote sensing

- analyzing how frequently contrails exist but are invisible in GOES-16 imagery

- evaluating contrail prediction models