



Making machine learning of aerosol and cloud features community based

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1 - SSEC Wisconsin Madison 2 - NRL 3 - UChicago

Aqua MODIS, 10 Sept. 2022 21:35 UTC

MYD04 AOD

AOD ~0.4

AOD ~3.7

MYD06 Cloud Phase Optical Properties

Water clouds

Ice clouds

Aqua MODIS, 10 Sept. 2022 21:35 UTC

Data labeling problem Either create segmented labels...



Data labeling problem

Either create segmented labels...or simple rectangle labels



A) What cloud type is this?

B) What cloud type is below the ice clouds?

C) What cloud type is this? Or are there more than one type?

Training dataset

- Adapted NASA Worldview to label regions over images.
- Labels: "clear-sky", aerosols, cirrus, cumuliform, openand closed-stratiform.
- For now only consider daytime over-ocean observations.



Instrument: VIIRS-SNPP; Cloud: Clear deep water; Aerosol: Severe smoke



Cloud class: Clear deep water • Acrosol class: Severe smoke • Update

Instrument: VIIRS-SNPP; Cloud: Clear deep water; Aerosol: Severe smoke

























Processing cost of experimental code

- It takes ~10min to process an ocean MODIS granule on a NVIDIA GPU.
- With 1 GPU it will take ~633 days to process 10 years of Aqua MODIS data.
- To process the 10-year dataset via AWS it will cost:
 - \$11,394 using the on-demand service
 - or \$6,152 with a three-year lease on 1 GPU.

Next steps going forward (1/2)

• Questions:

□ How do we quantitative evaluate the inference of cloud types and aerosols?

- □ How do we more efficiently label MODIS/VIIRS/AHI/ABI observations?
- □ How should we deal with multiple layers of clouds / aerosols?
- □ How do adapt the inference method to work over land?

Next steps going forward (2/2)

• Work we have started to do:

Adding more label types: 1) cirrus above water clouds, 2) tenuous aerosols and 3) tenuous cirrus clouds.

□ Investigate how to improve processing efficiency of the inference method.

• Long term goal:

To achieve high spatial resolution cloud / aerosol type inference with multiple layers, we need to incorporate a radiative transfer model with the NN method.

Extra slides





