Satellite and InSitu Aerosol Measurements

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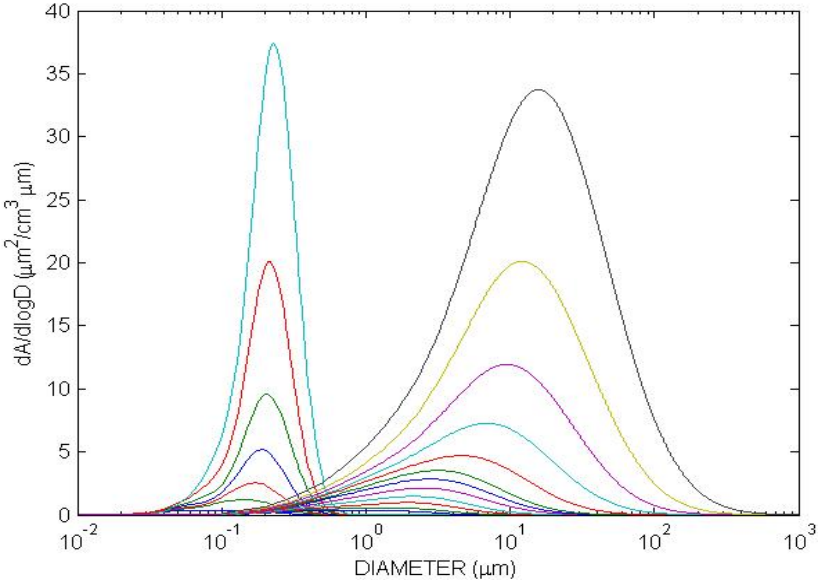
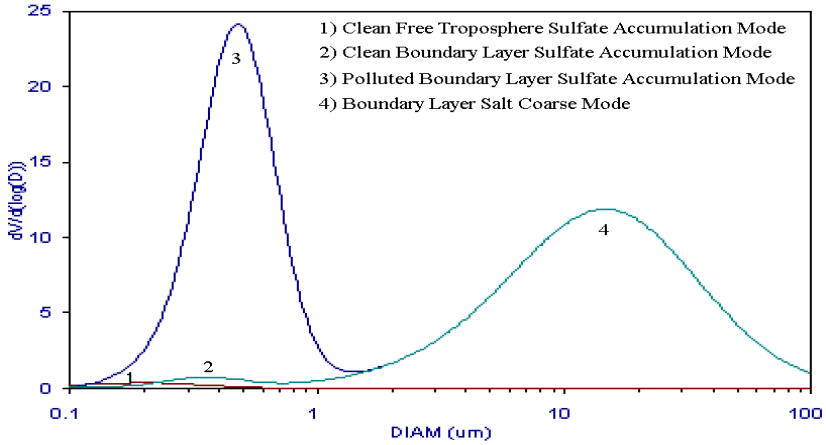
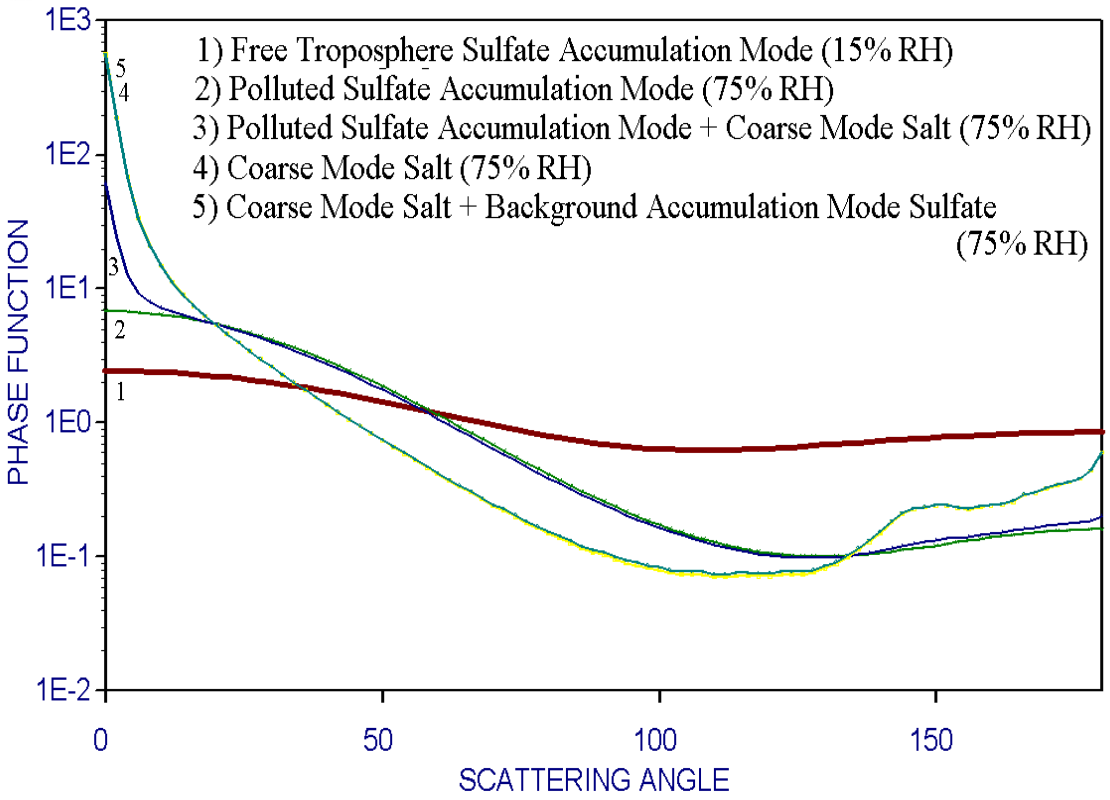
Aerosol Models (Porter + Clarke, 1997)



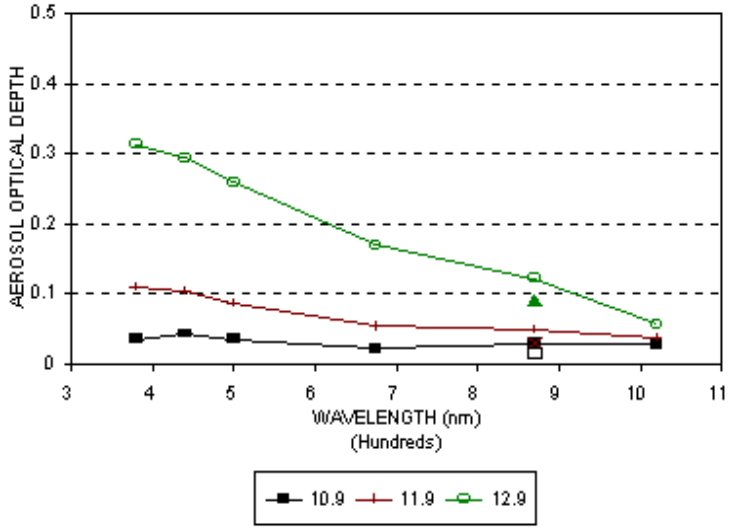
Typical Hawaii Size Distributions



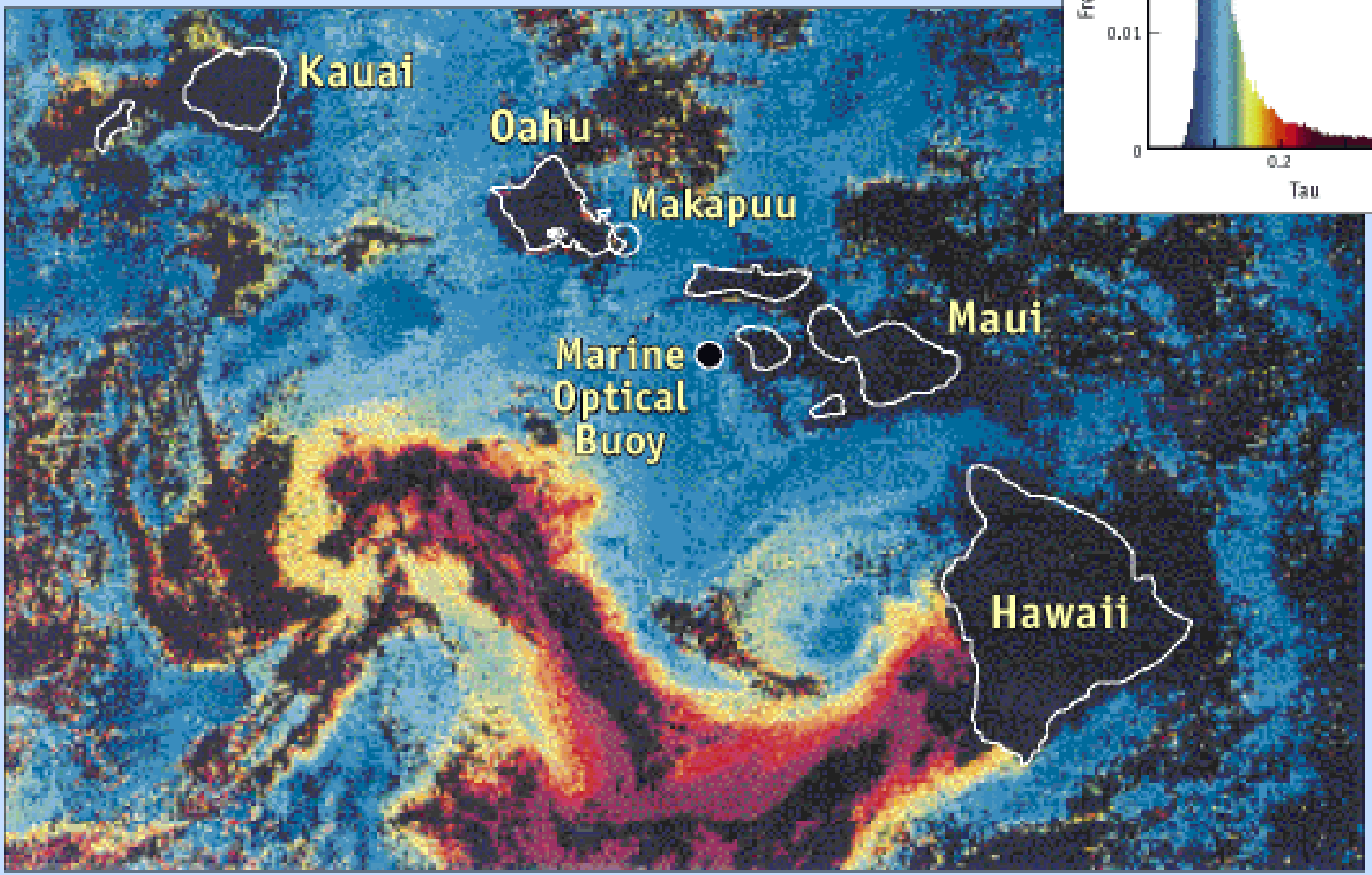
Typical Aerosol Phase Functions

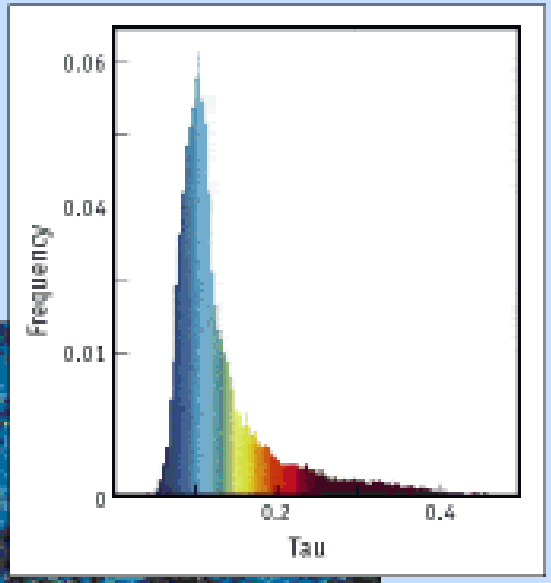


Typical Optical Depths

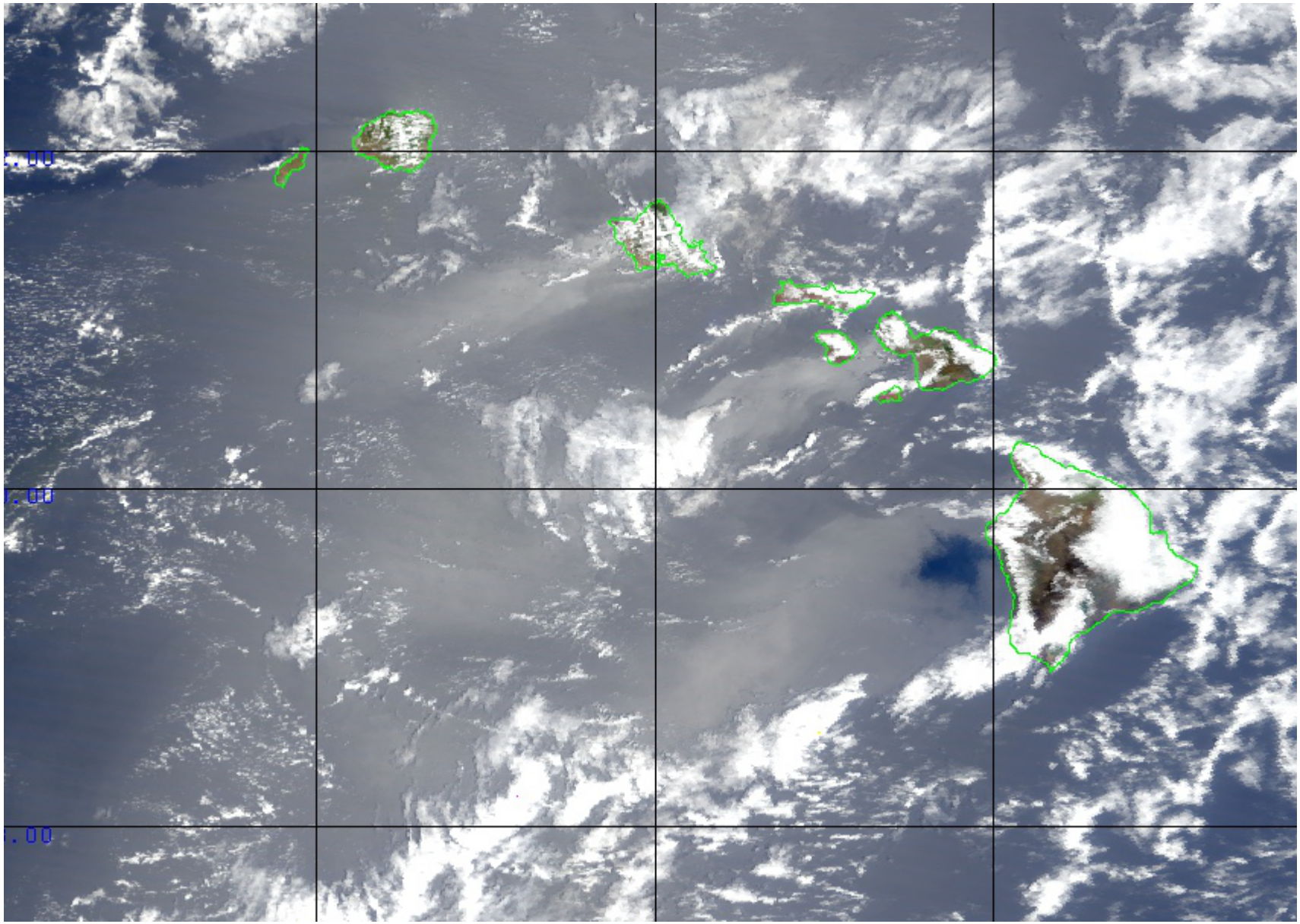


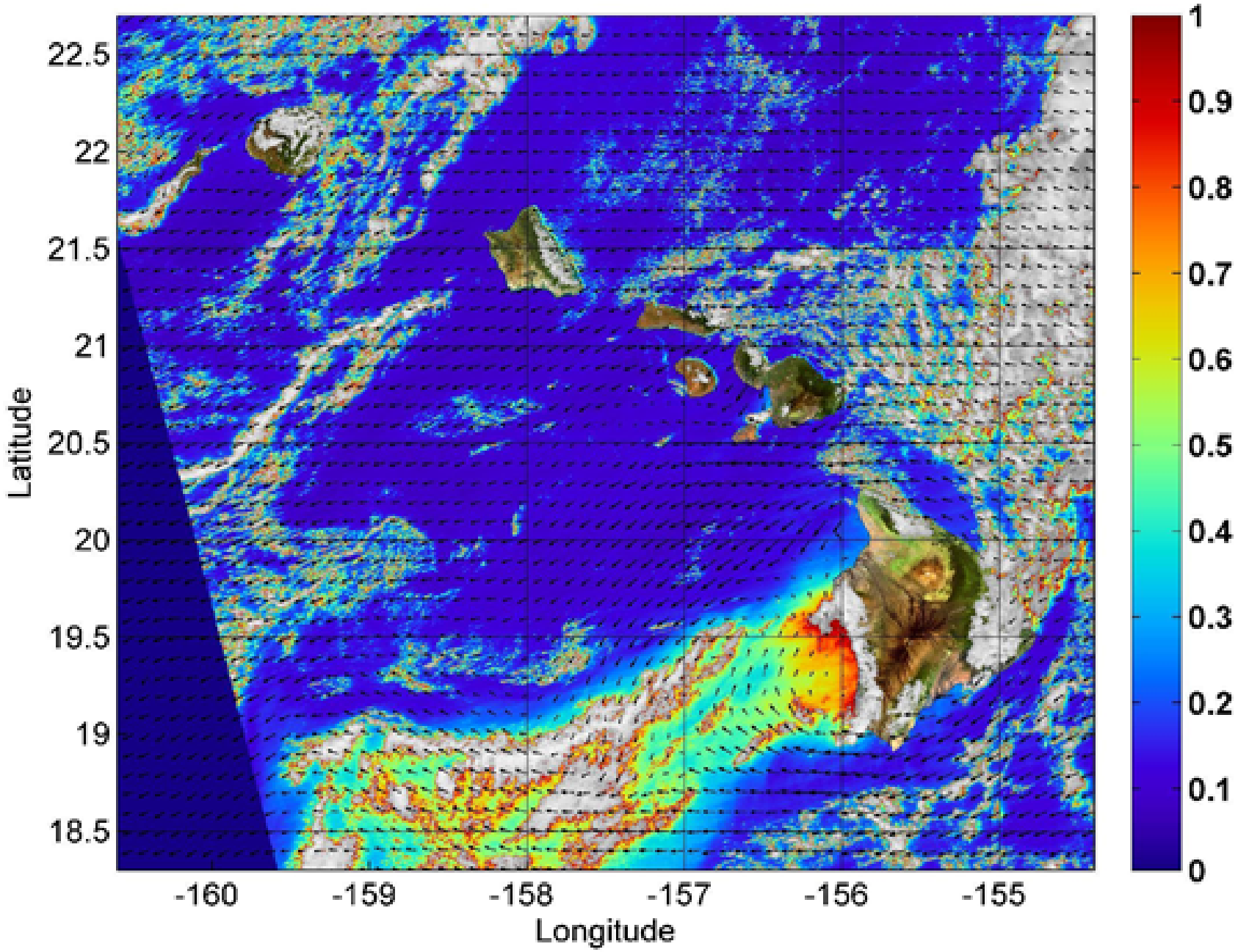
Aerosol Optical Depth From AVHRR Satellite (1993)



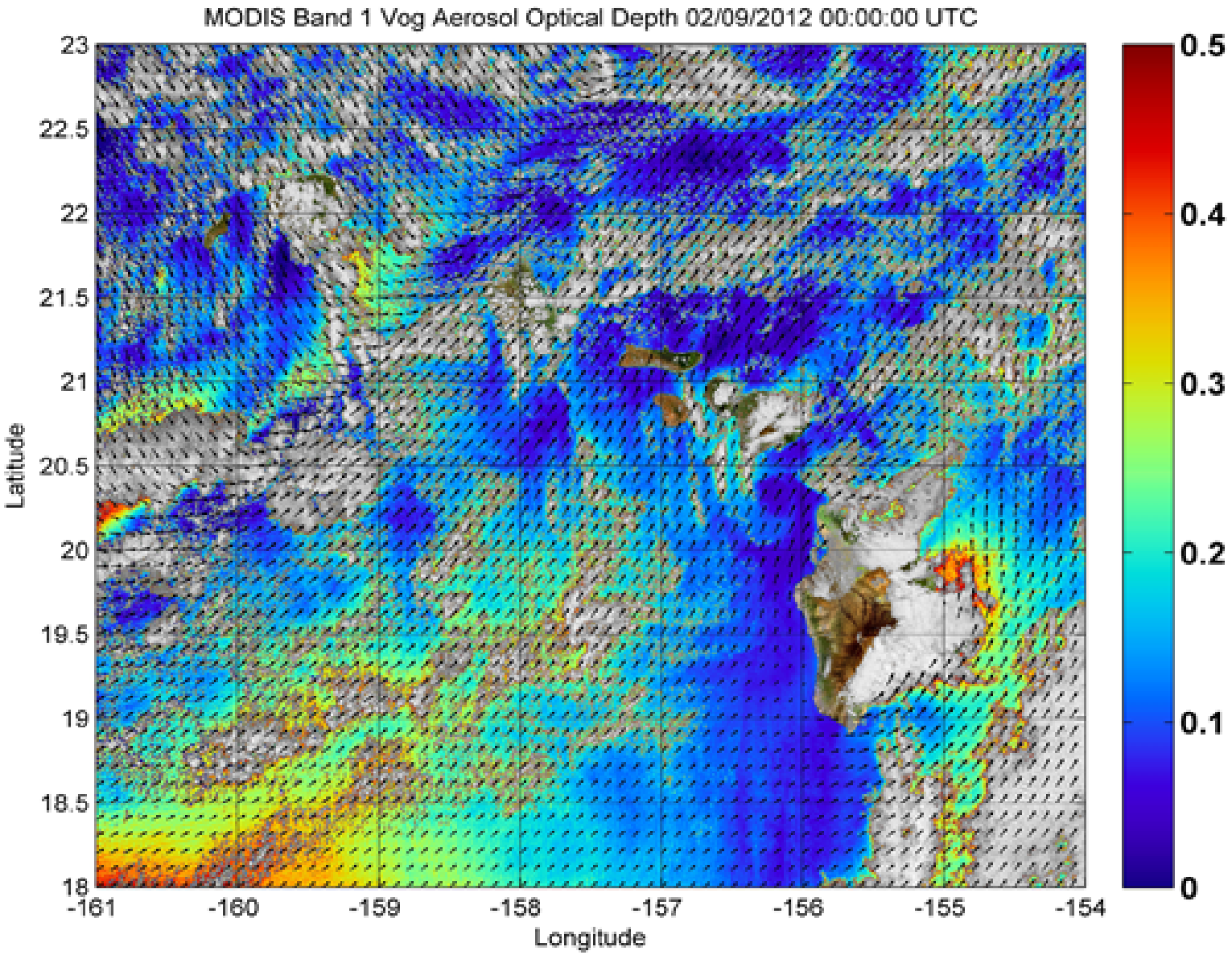


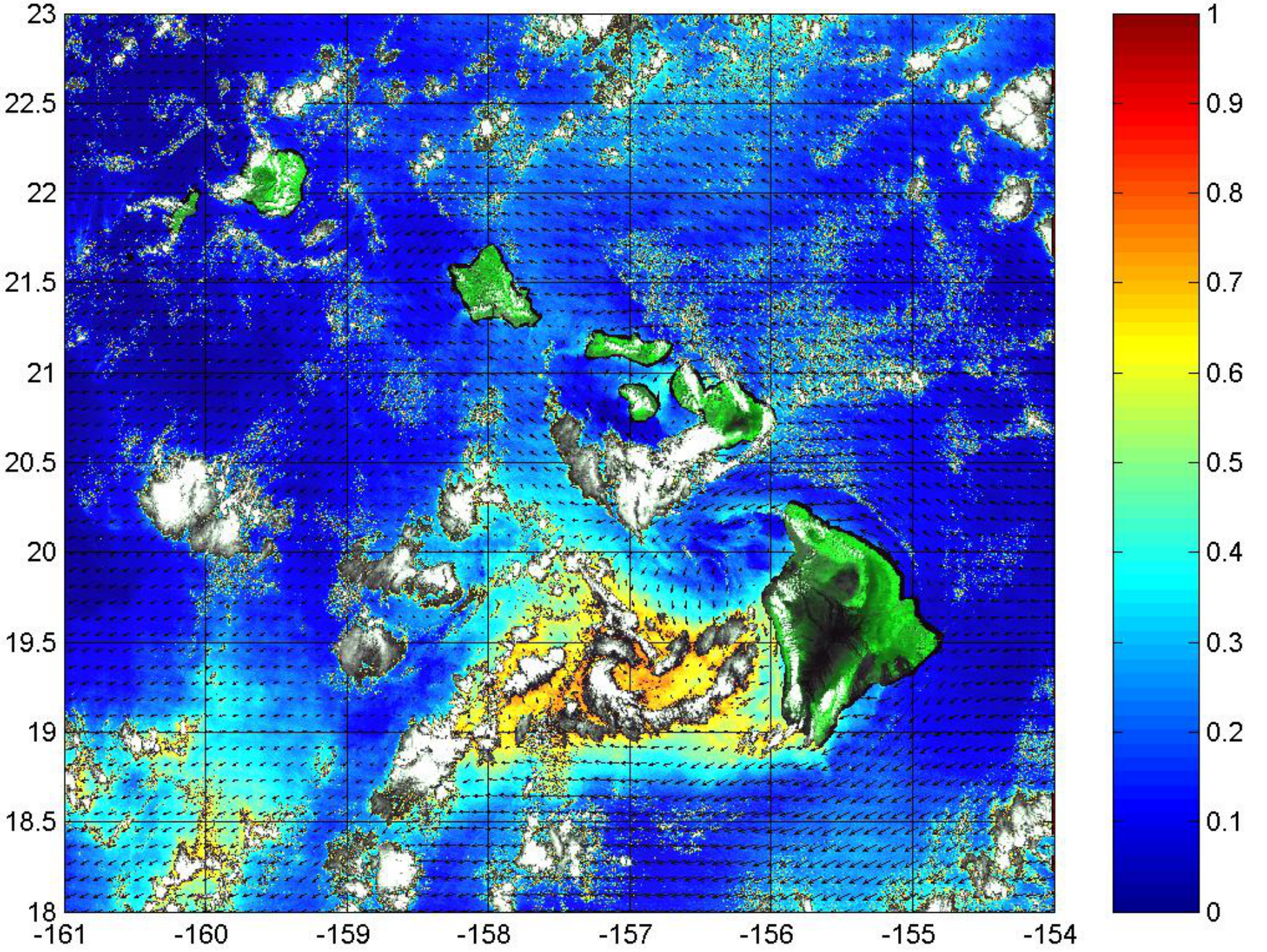
Sun glint affected by Hawaii Orography: Need Accurate Meso-Scale Wind Fields

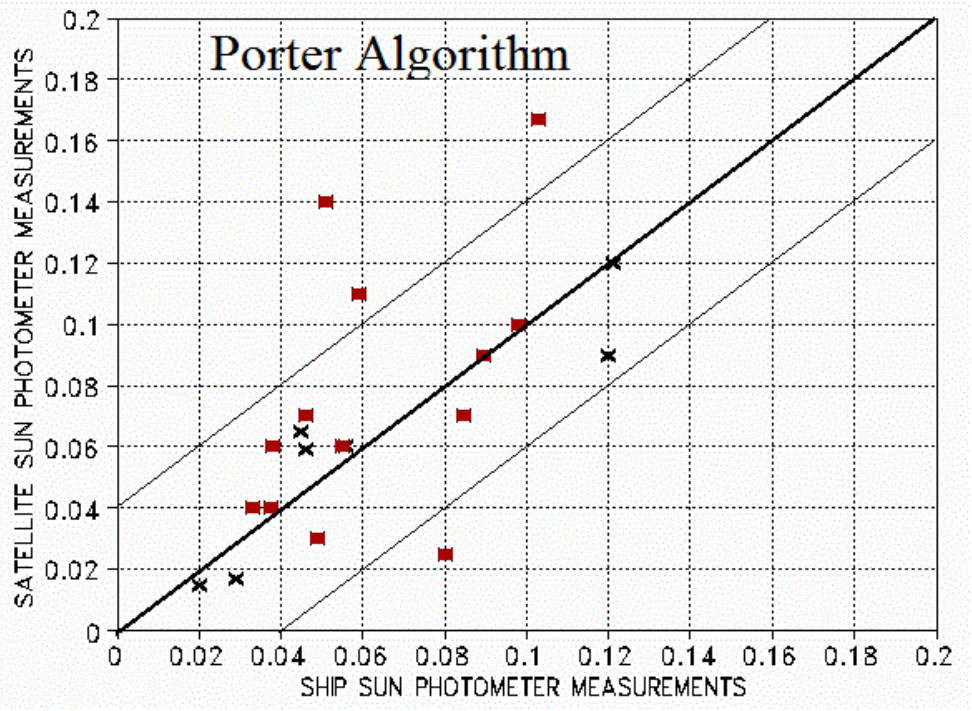


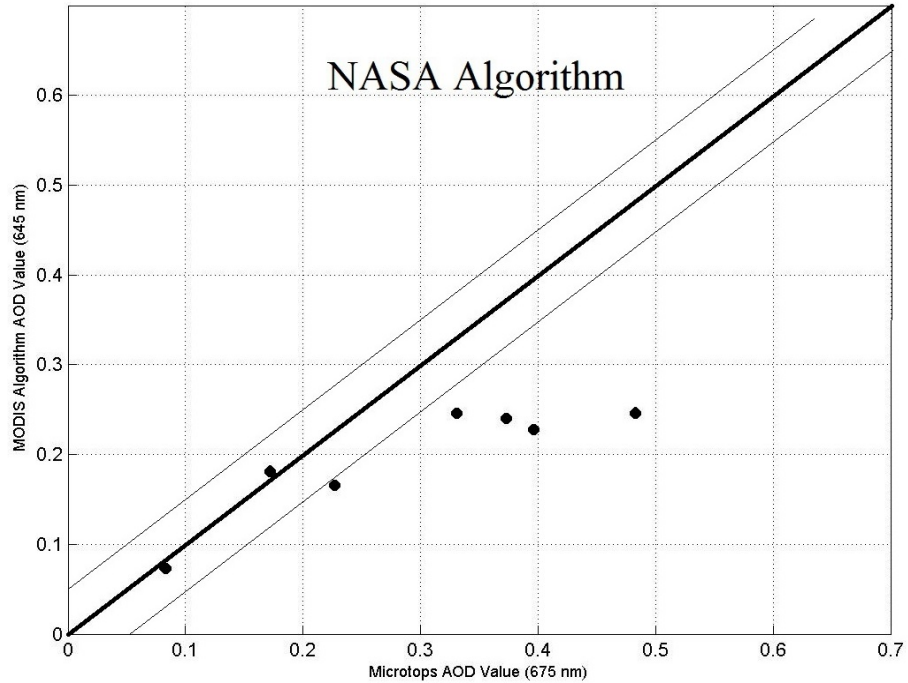

MODIS Band 1 Vog Aerosol Optical Depth 12/10/2013 23:14:00 UTC
Latitude
22.5
22
21.5
21
20.5
20
19.5
19
18.5
-160
-159
-158
-157
-156
-155
Longitude
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

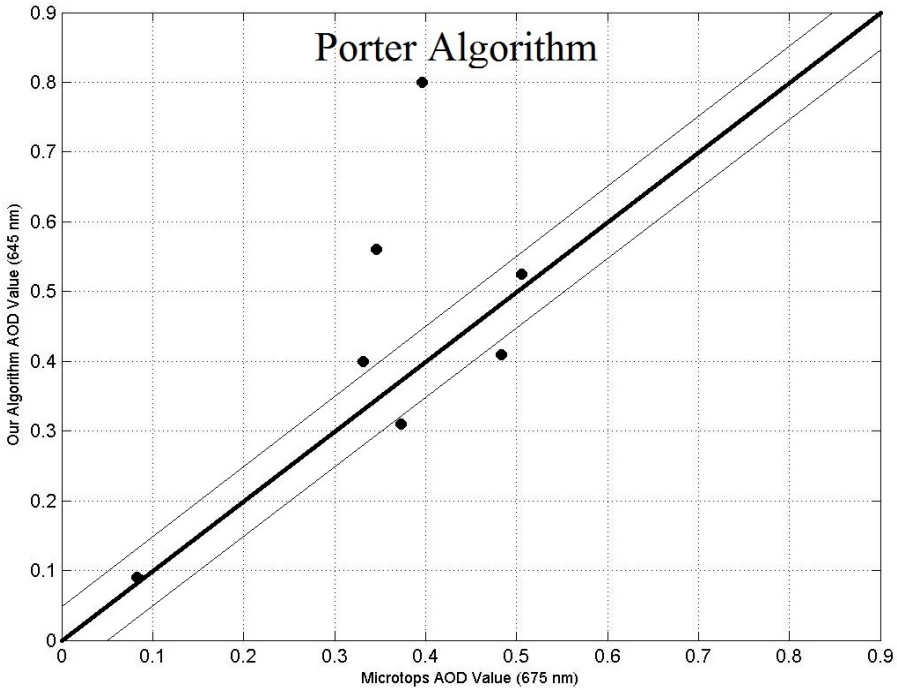
As Cold Fronts Approach, Kona Winds Carry VOG Back Towards Hawaii (Patchy and Difficult To Forecast...)

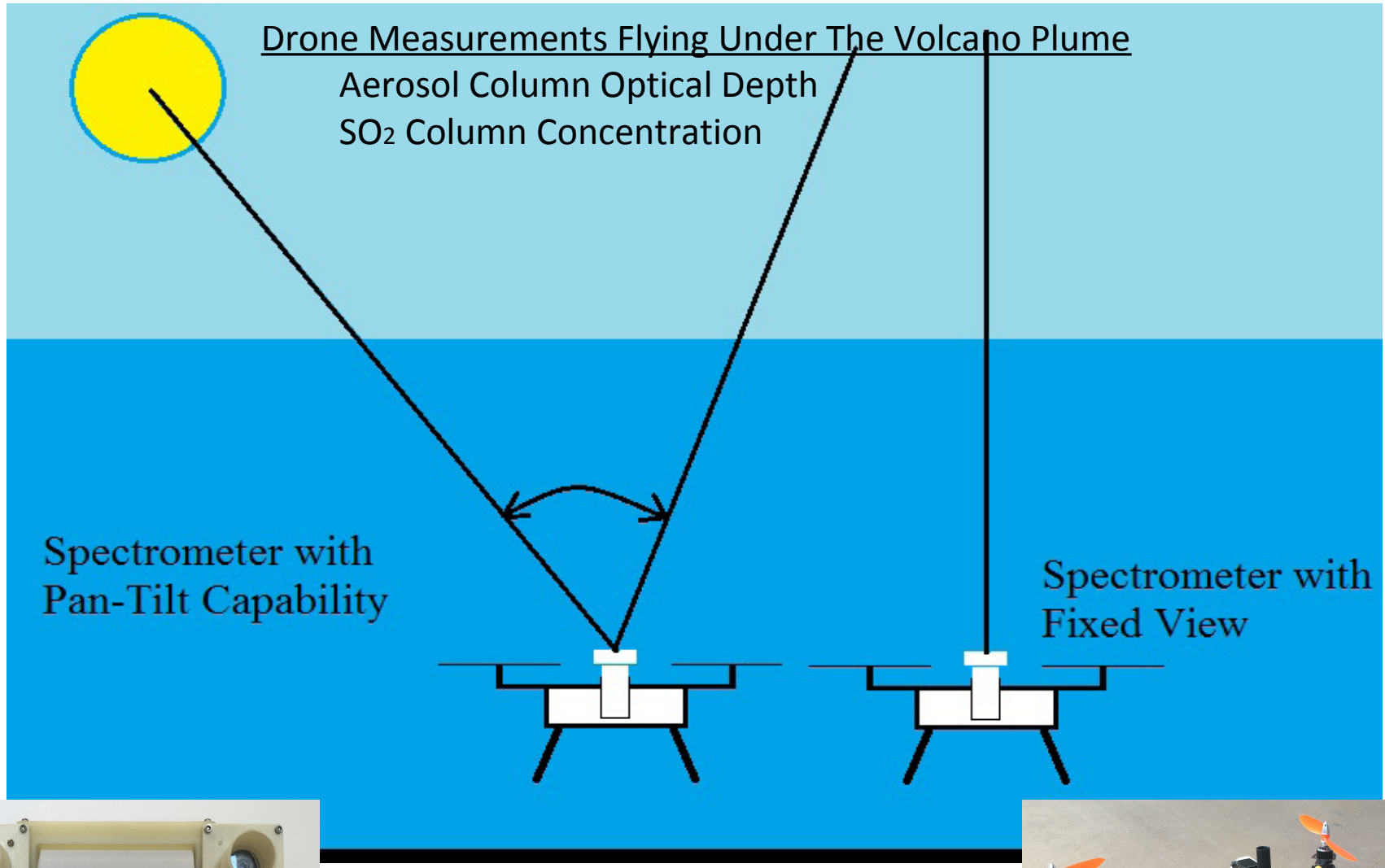


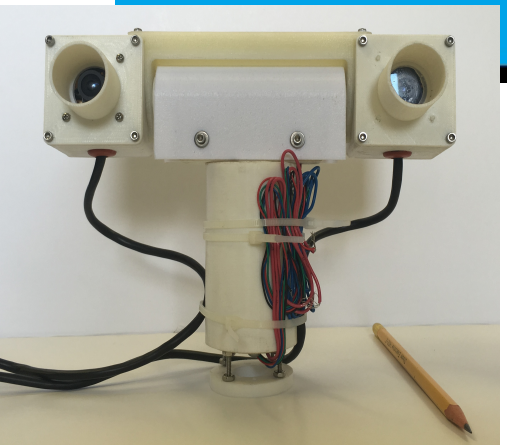

23
22.5
22
21.5
21
20.5
20
19.5
19
18.5
18
-161
-160
-159
-158
-157
-156
-155
-154
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

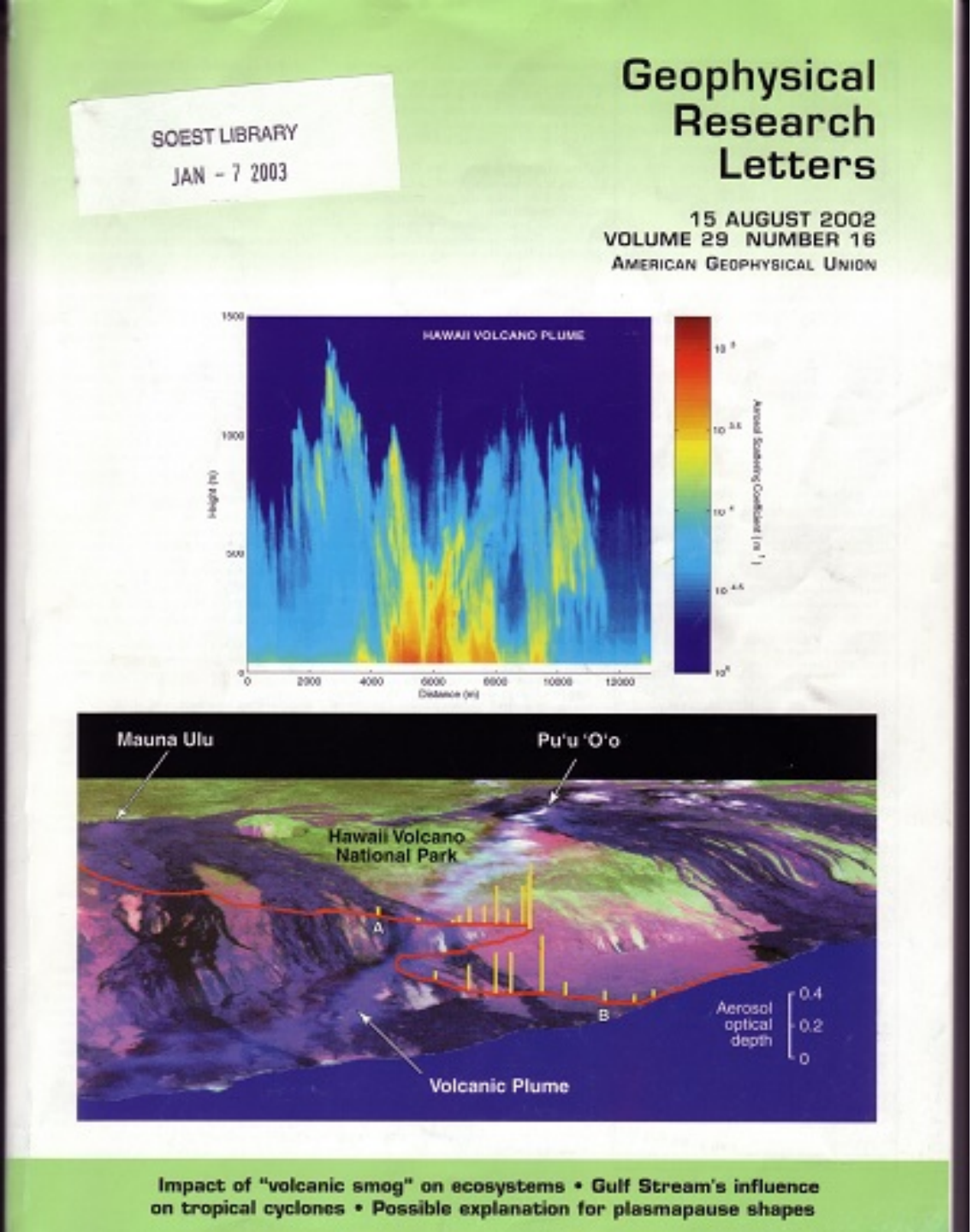

Porter Algorithm
SATELLITE SUN PHOTOMETER MEASUREMENTS
SHIP SUN PHOTOMETER MEASUREMENTS
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2


NASA Algorithm
MODIS Algorithm AOD Value (645 nm)
Microtops AOD Value (675 nm)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7


Porter Algorithm
Our Algorithm AOD Value (645 nm)
Microtops AOD Value (675 nm)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


Drone Measurements Flying Under The Volcano Plume
Aerosol Column Optical Depth
SO2 Column Concentration
Spectrometer with
Pan-Tilt Capability
Spectrometer with
Fixed View





Hawaii Volcano Plume Flux Measurements.

SO_2 Half Life In Hawaii Volcano Plume

6 Hours (+-4 Hours)

Porter, et al., 2002, Lidar and Sun Photometer Measurements of The Hawaii Pu'u O'o Volcano Plume: Estimates of SO_2 and Aerosol Flux Rates and SO_2 Lifetimes, Geo. Res. Let., 29, 2002GL014744, 2002