Updated MISR Dark-Water Research Aerosol Retrieval Algorithm
Part 1: Empirical Calibration Corrections and Coupled 1.1 km Ocean-Surface Chlorophyll-a Retrievals

James A. Limbacher[1,2] and Ralph A. Kahn[1]

[1]Earth Science Division, NASA Goddard Space Flight Center
Greenbelt MD 20771

[2]Science Systems and Applications Inc., Lanham MD 20706

Supplemental Material

This supplement presents a few examples of individual MISR RA joint surface and atmosphere retrievals, and comparisons with the corresponding MISR SA retrievals, MODIS *Chl* results, and embedded AERONET AOD measurements and particle property retrievals. A detailed analysis of the impact of the ocean surface retrieval and aggregated calibration corrections on retrieved aerosol type will be given in Part 2 of this study.

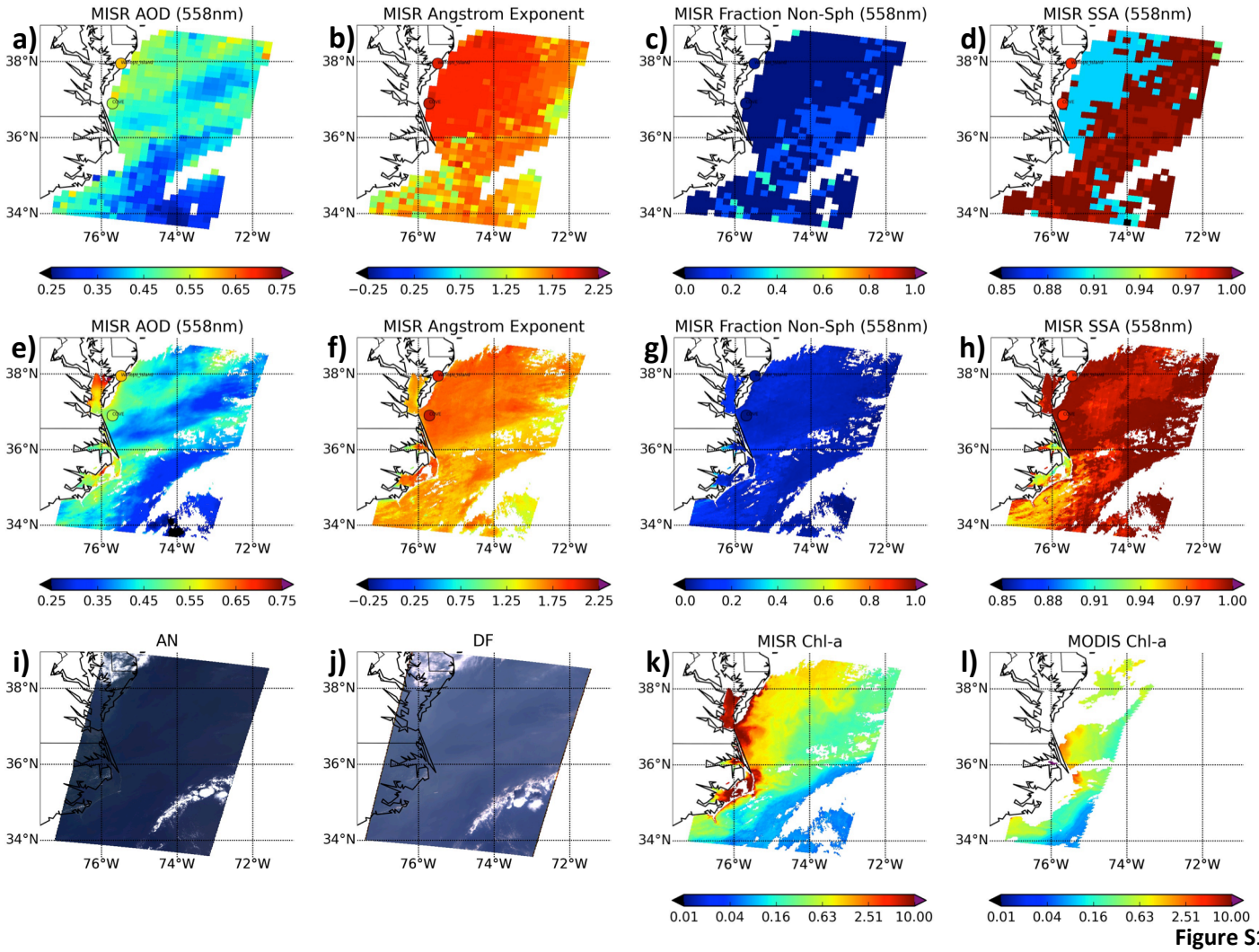

Figure S1

Figure S1. MISR imagery acquired on August 26, 2003, 15:51Z: Terra Orbit 19620, Blocks 60-63, along the US East Coast. AERONET particle properties indicate that the scene is dominated by small, spherical, weakly or non-absorbing pollution and/or smoke particles. Plots compare the MISR SA (at 17.6km resolution, panels a-d) to the RA that includes retrieved *Chl* (at 1.1 km

resolution; panels e-h, k). AERONET direct-sun and inversion values are shown for the COVE and Wallops stations as embedded circles. MISR AN (i) and DF (j) RGB images are shown for context. AERONET Fr. Non-Sph may not be informative when aerosol extinction is dominated by the fine mode. MISR-retrieved *Chl* is shown in (k) and MODIS-retrieved *Chl* is shown in (l). Note that both the SA and RA identify the scene as dominated by small, spherical particles. The SA appears to incorrectly identify part of the scene as contaminated by moderately absorbing aerosol, whereas the RA finds the entire scene to contain weakly or non-absorbing particles, which is more consistent with AERONET. For the retrieved small spherical particles, the real part of the refractive index is assumed to be larger for the RA than the SA, so the MISR RA tends to pick slightly larger aerosol models (ANG~1.72), in poorer agreement with AERONET (ANG~2.05) than the SA (ANG~2.00). The selection of aerosol optical models for the RA is currently being investigated, and the results will be presented in part II of this study. Ultimately, we are hoping to systematically acquire direct, *in situ* measurements of the particle optical and chemical properties for the major aerosol air mass types, to put these remote-sensing algorithm assumptions on more solid footing [*Kahn et al*., 2016].

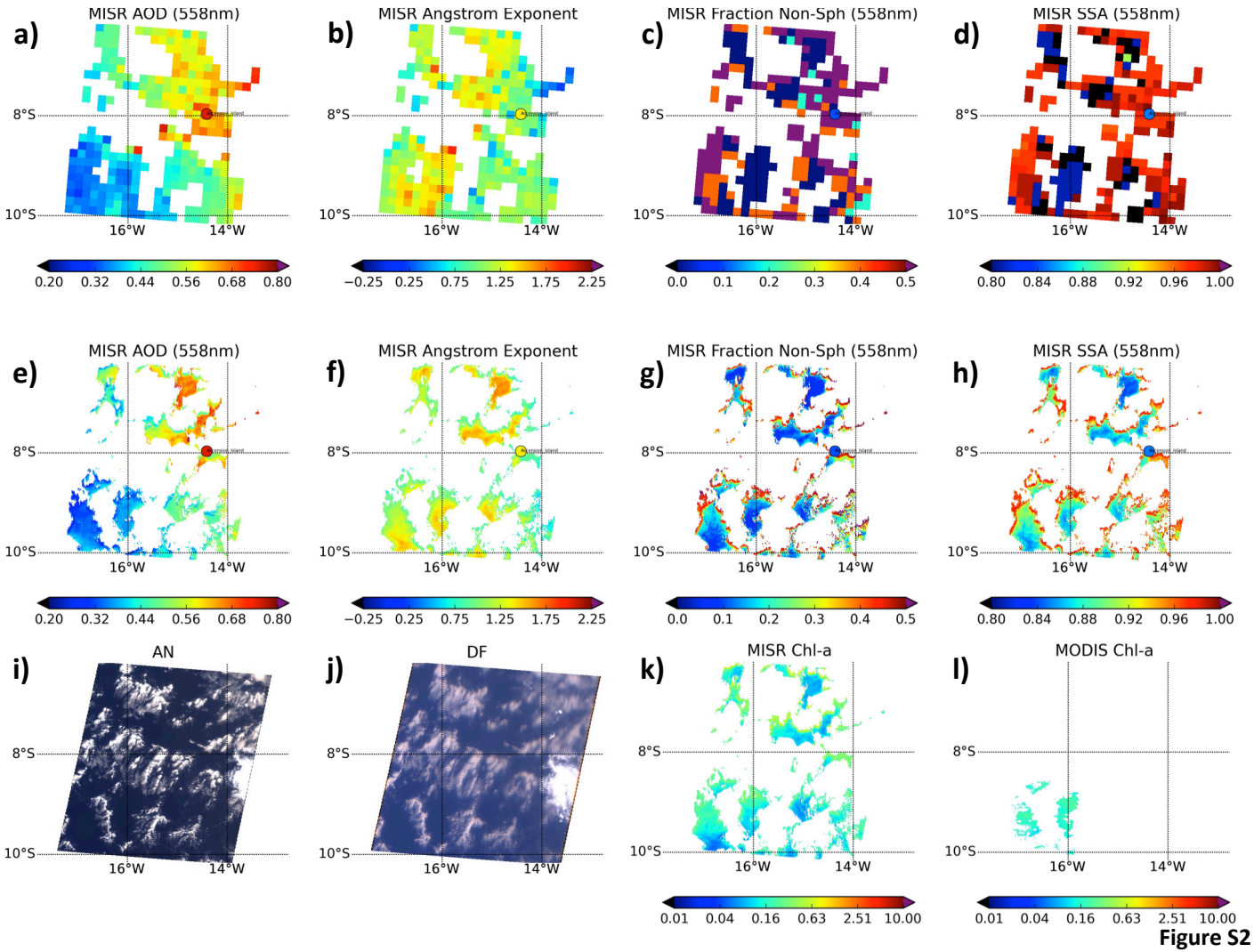

Figure S2

Figure S2. Same as Figure S1, but for data acquired on August 31, 2003, 11:26Z: Terra Orbit 19690, MISR Blocks 96-98, in the mid-south Atlantic Ocean near Ascension Island. Note that both the SA and RA identify much of the scene as dominated by small, spherical

absorbing aerosol. Although both algorithms are clearly influenced by 3-d light-scattering effects near cloud edges, the anomalies are much more localized in the higher-resolution RA retrievals than the SA, and the SA shows substantially more SSA (and hence retrieved aerosol type) variability (0.92 ± 0.08) compared to the RA (0.91 ± 0.04). The artificially enhanced variability due to 3-d effects also shows up for the SA and RA in both ANG and Fr. Non-Sph. The 3-d effects appearing in the MISR RA retrieved aerosol type are also reflected in the MISR RA retrieved *Chl*, giving an indication of the impact aerosol type has on retrieved ocean color.

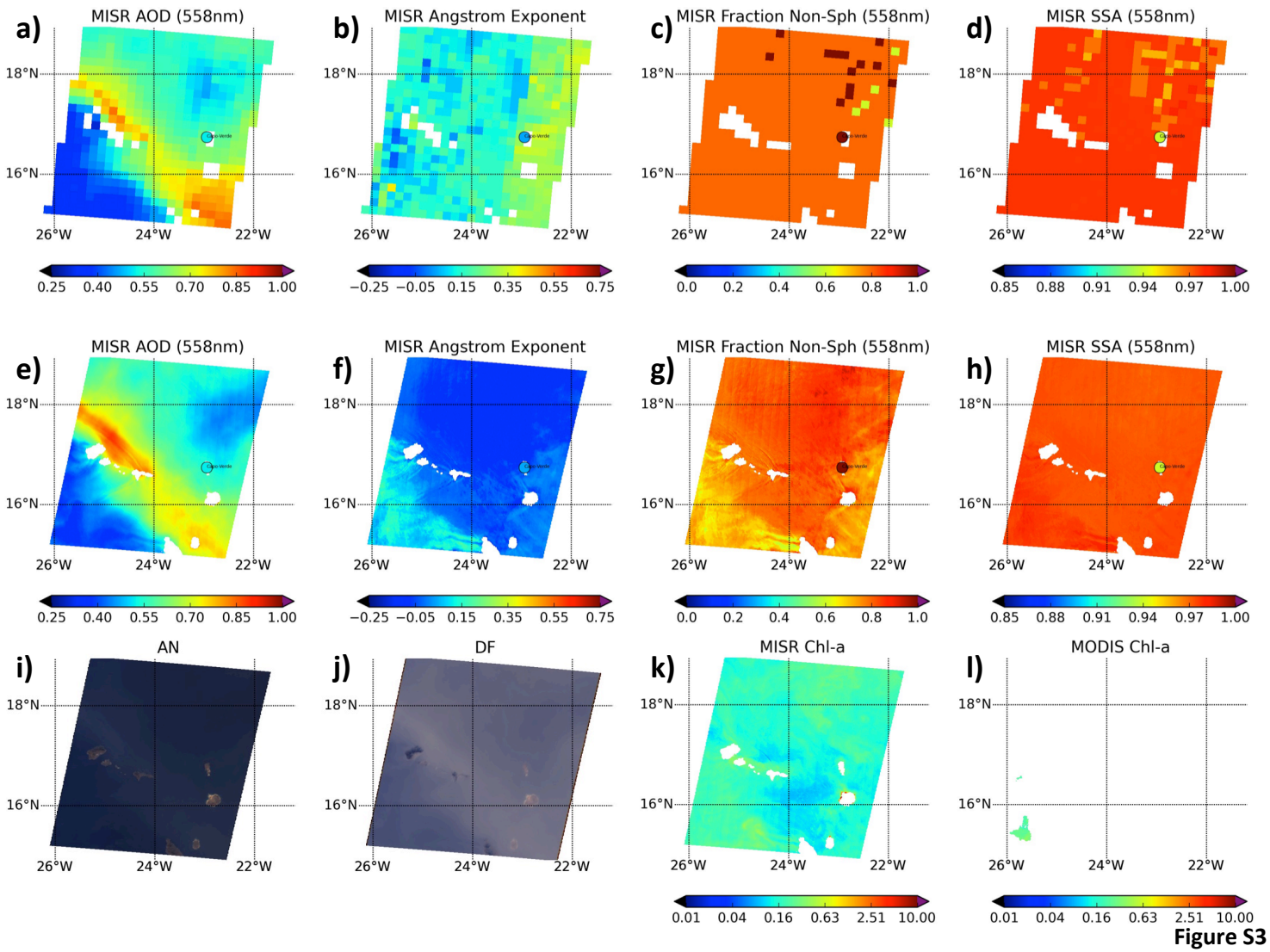

Figure S3. Same as Figure S1, but corresponding to February 6, 2004, 12:16Z: Terra Orbit 22006, MISR Blocks 76-78, in the North Atlantic off the West African coast. AERONET (level 2.0 for inversion) particle properties indicate that the scene is dominated by large,

non-spherical, weakly absorbing aerosol. AERONET direct-sun and inversion values are shown for the Capo-Verde station as embedded circles. Because AERONET does not have a spectral channel near 558 nm for this site, the SSA must be interpolated between the blue and red, resulting in a large SSA uncertainty. Both the SA and RA identify the scene as dominated by transported dust. Compared to AERONET's direct sun measurements of 0.52 and 0.04 for AOD and ANG, the RA retrieves an AOD of 0.55 and ANG of -0.05, whereas the SA retrieves an AOD of 0.6 and ANG of ~0.28. Both the SA and RA produce scene average Fr. Non-sph values near 0.8, which is lower than AERONET's value of 1.0. Lee waves, which appear to slightly modify retrieved AOD, can be seen in the MISR RA on the leeward side of some of the islands. Even though significant dust loading is present over much of this scene, there are few apparent anomalies in the MISR retrieved *Chl*.