EPIC Cloud Product Description

Yuekui Yang
(613, NASA Goddard Space Flight Center)

The EPIC Level 2 cloud products include Cloud Mask (CM), Cloud Effective Pressure (CEP), Cloud Effective Height (CEH), and Cloud Optical Thickness (COT). All the products are provided at the EPIC original temporal and special resolutions. CEP and CEH are provided for oxygen A- and B-bands, respectively.

A suite of algorithms has been developed to generate the EPIC cloud products. (1) The EPIC cloud mask is based on the threshold method; surface is classified into three categories: land, deep water and snow/ice; for each surface type, two independent tests are applied and the final cloud mask with confidence level is determined through combining the results from the two tests. (2) For the cloud effective pressure/height, the Mixed Lambertian-Equivalent Reflectivity (MLER) model (e.g., Koelemeijer et al., 2001, Yang et al. 2013) is adopted, which assumes that an EPIC pixel contains two Lambertian reflectors, the surface and the cloud. This assumption simplifies the radiative transfer equation and cloud pressure can be retrieved using the oxygen A- and B-band pairs. Since the MLER model does not take into account the effect of photon penetration into clouds, the retrieved cloud pressure is an effective pressure. By incorporating the GEOS-5 forecasted atmospheric profiles, the effective cloud pressure is converted to effective cloud height. (3) The EPIC COT product is produced using the operational MODerate-resolution Imaging Spectroradiometer (MODIS) cloud retrieval infrastructure (Platnick et al. 2003). The MODIS system provides simultaneous two-channel retrievals of COT and cloud effective radius (CER), and cloud phase retrievals using a variety of spectral tests. However, since EPIC does not have a particle size sensitive channel, a single channel retrieval algorithm is developed assuming fixed values for CER (Meyer et al., 2016). In addition, cloud phase determination capability for EPIC is limited; hence the EPIC COT product provides two retrievals for each cloudy pixel, one assuming liquid phase and the other ice phase. A likely cloud phase is also provided based on the cloud effective height.

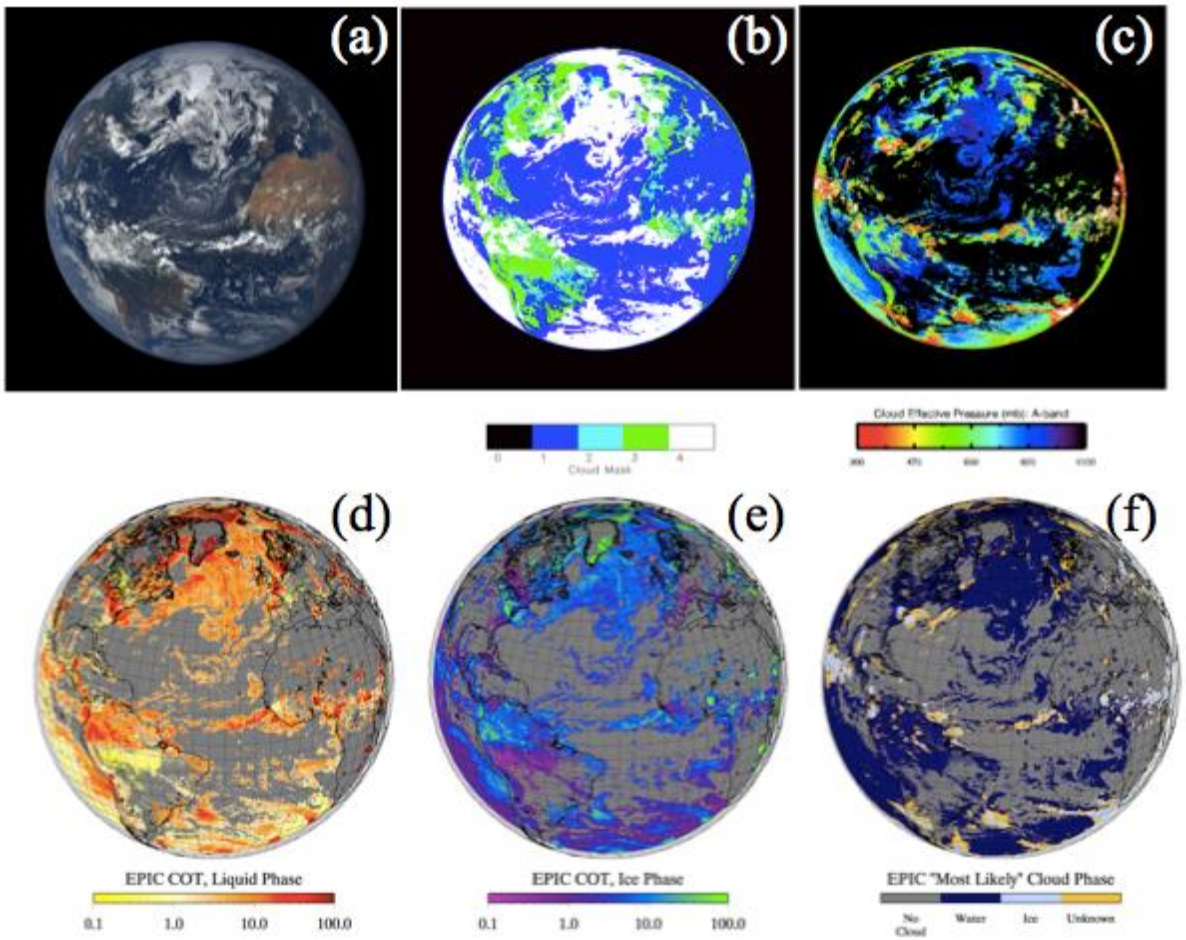
References

Koelemeijer, R. B. A., P. Stammes, J. W. Hovenier, and J. F. de Haan, 2001: A fast method for retrieval of cloud parameters using oxygen A band measurements from the Global Ozone Monitoring Experiment, *J. Geophys. Res.*, 106, 3475–3490.

Meyer, K., Y. Yang, and S. Platnick, 2016: Uncertainties in cloud phase and optical thickness retrievals from the Earth Polychromatic Imaging Camera (EPIC), *Atmos. Meas. Tech.*, 9, 1785-1797, doi:10.5194/amt-9-1785-2016.

Yang, Y., A. Marshak, J. Mao, A. Lyapustin, J. Herman, 2013: A Method of Retrieving Cloud Top Height and Cloud Geometrical Thickness with Oxygen A and B bands for the Deep Space Climate Observatory (DSCOVR) Mission: Radiative Transfer Simulations. *J. Quant. Spectrosc. Radiat. Trans.* Volume 122, June 2013, Pages 141-149, ISSN 0022-4073, http://dx.doi.org/10.1016/j.jqsrt.2012.09.017.

Distributed by the Atmospheric Science Data Center
http://eosweb.larc.nasa.gov



Sample EPIC L2 cloud products for the observations at 14:57 GMT on June 23, 2016: (a) EPIC RGB image; (b) EPIC cloud mask. 1: high confidence clear, 2: low confidence clear, 3: low confidence cloudy, and 4: high confidence cloudy; (c) oxygen A-band cloud effective pressure; (d) cloud optical thickness assuming liquid phase; (e) cloud optical thickness assuming ice phase; (f) most likely cloud phase. Other L2 cloud products not shown include oxygen B-band cloud effective pressure, and A- and B-band cloud effective height.

Distributed by the Atmospheric Science Data Center
http://eosweb.larc.nasa.gov