Cloud information content in EPIC/DSCOVR's oxygen A- and B-band channels: A physics-based approach

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Highlights

- We investigate cloud information content in EPIC's differential optical absorption spectroscopy measurements for O_2 A- and B-bands with an analytical radiative transfer model for these signals that is based on a pragmatic merger of asymptotic and diffusion theoretical results.
- We quantify the impacts on the retrieved cloud top height of random measurement error and of systematic forward modeling error when in-cloud light penetration is ignored.
- We confirm with a radically different approach a previous theoretical assessment of EPIC cloud profiling capability, concluding that only the cloud's top height can be retrieved with acceptable uncertainty under most circumstances, and not its geometrical thickness; nonetheless, the finite cloud thickness must be accounted for to avoid bias in height retrievals.
- We verify that diffusive light propagation in plane-parallel slabs has the remarkable invariance property of the mean path length demonstrated recently for uniform non-absorbing media with arbitrary shapes, opacities, and scattering phase functions.