High temporal resolution Pandora observations: An outlook for assimilating future geostationary platforms into global reanalyses

Robinson, J.; **Kotsakis, A.**; **Santos, F.**; **Knowland, K. E.**; **Swap, R.**; **Cede, A.**

Reanalysis datasets are a widely used tool because of their ability to accurately represent the state of the climate to within approximately a few weeks of the present. They do this through assimilating both dynamical and chemical observations, often from polar-orbiting satellite platforms, into the model framework. However, the next generation of geostationary atmospheric composition satellites will present a new set of observations with enhanced temporal resolution that need to be assimilated. Our goal is to utilize high temporal resolution Pandora observations in the northern hemisphere mid-latitudes and identify any biases that currently exist in two global reanalysis datasets ahead of this upcoming challenge. Further, we evaluate these biases with an outlook for the future assimilation of both Pandora and geostationary platforms. We compare total column ozone from the NASA MERRA-2 and ESA ERA-5 reanalyses to Pandora observations and constrain our comparisons by dynamics (e.g., 24-hour pressure fall) and diurnal variability. We find a marked negative impact on comparisons with observations during the passage of dynamic weather patterns. Further, we find a negative impact on comparisons outside of afternoon satellite overpass times. This suggests a strong dependence in the models to these overpasses and that there may be improvement in representing total ozone through the assimilation of observations with enhanced higher temporal resolution.

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