ABSTRACT: A prototype optimal estimation CO retrieval framework using CrIS thermal-IR spectra is being developed and undergoing initial testing and evaluation. The goal is construction of a multi-decadal climate-quality data record, consistent with MOPITT, extending into the post-EOS/Terra era, given the planned JPSS mission schedule. The EOS/MOPITT instrument has an ongoing and unprecedented record of CO retrievals since early 2000. CrIS CO offers the potential to significantly extend the MOPITT thermal-IR retrieval record as well as providing expanded spatial coverage. The prototype CrIS CO optimal estimation retrieval system is outlined and initial results described. CO retrievals have been carried out during the fires near Fort McMurray Canada in May 2016, and in the winter-season California Central Valley. These initial CrIS retrievals are in reasonable accord with independent measurements from MOPITT (Fort McMurray: Hi-Res Spectra) and DISCOVER-AQ (CA Central Valley: Low-Res Spectra). This work provides a robust foundation for planned improvements, as well as a demonstration of the utility of this approach to term CO record development.

Summary / Conclusions / Plans

1) Prototype CrIS Fast Physical Retrieval for CO has been developed at NCAR based on a code framework for NH₃ retrievals developed earlier by AER.
2) CrIS CO profile and total column retrievals have been carried out using high-resolution and low-resolution CrIS spectra for selected scenes.
3) Optimal estimation framework; MOPITT-based apriori covariance; initial high-res/low-res CO micro-window assignments.
4) High-res CrIS CO retrievals successfully carried out for the Fort McMurray, Canada, fires on 6 May 2016. Low-res retrievals successfully carried out over the California Central Valley for 30 January 2013.
5) Retrievals exhibit a high-percentage convergence fraction; reasonable optimal-estimation averaging kernels; reasonable DFS figure of merit. DFS using high-res spectra (Fort McMurray) is similar to DFS using low-res spectra (CA Central Valley).
6) CrIS hi-res profile retrievals have smaller uncertainty compared to low-res profile retrievals.
7) Initial CrIS retrieval validation is limited to small datasets; large retrieval ensembles are needed. A faster forward model and an enhanced retrieval algorithm with cloud clearing are essential next steps. These are under development.

Acknowledgement: Use of DISCOVER-AQ data courtesy G. Diakin (http://www-air.larc.nasa.gov/cgi-bin/ArView/discover-aq.ca-2013)