

All-sky AMSU-A radiance data assimilation using the gain-form of the Local Ensemble Transform Kalman filter within MPAS-JEDI-2.1.0: implementation, tuning, and evaluation

Specific comments:

Section 2.2: The offline tool you describe to remove bad or thinned observations based on the ensemble mean HofX sounds similar to what the new “reduce obs space” filter action does in JEDI. Perhaps you should reference this new action here so that other JEDI users are aware of this updated functionality.

Section 2.2: Could you provide some comparisons of the runtime before and after implementing these optimizations to parallelize the HofX calculation. I think a main novelty of this study is the use of MPAS-JEDI, and it would be nice to focus a little more on the improvements you made to that system.

L157: The 25 minute runtime for the solver step is very long and not feasible for operational settings. Does the runtime scale well with increasing nodes or cores? Also, could you add some details on ideas or current progress on how this will be sped up?

L211: “Pixels with a significant CLW content are excluded”. This is vague - could you give the exact threshold for CLW?

Fig. 3: It is a little hard to deduce the different lines here when they overlap. Perhaps a plot of consistency ratio would be better? If you choose to keep the same format, I recommend changing the x-axis label to “RMSE, Total Spread” instead of “RMSE/Total Spread”.

Section 4.2: Given that the 300 km localization scale produced the best results, do you think lowering it more would further improve results? This doesn’t necessitate a new experiment, but it would be nice to comment on the possibility.

L356: It is confusing to state that there is a “pronounced cold bias” but also see that the dashed lines in Fig. 6a are greater than zero below 50 degrees south. I recommend plotting $-1 \times \text{OMB}$ to show the more commonly interpreted version of Bias. I also recommend adding a thicker vertical line for 0 K so that we can better deduce between warm and cold biases. Also, the phrasing here that “AllSky exhibits a pronounced cold (warm?) bias” suggests that ClrSky does not have the same bias. But really it is AllSky that is further increasing the warm bias.

Technical comments:

L86: “linearized hydrostatic balance constraint is when” -> “the linearized hydrostatic balance constraint is used when”

L102: Relaxation is misspelled

L156: Saying “about 286 seconds” feels overly precise for something meant to be approximate. To stay consistent with how the other runtimes are described, maybe just say “about 5 minutes” instead.

L169: The list of physical parameterization schemes is a bit long and wordy. I recommend moving this list into a table.

L195: “configured mimic” -> “configured to mimic”

L199: “Quality” should be capitalized in the section name

L240: The sentence beginning “All experiments begin from...” is long and should be split in two.

L313: “observations than using” -> “observations compared to using”

L351: “NOOA” -> “NOAA”

L369: “presents” -> “present”

L376: “LGETK” -> “LGETKF”

L381: “climatology, and excluded” -> “climatology and are excluded”

L384: “vertically averaged” -> “vertically-averaged”