

Guiding Principles for Updates to the GEOS-Chem Model

This document developed through conversation about how to identify model developments for inclusion in the GEOS-Chem standard simulation, and how to promote model development as a robust state-of-the-science facility. The document is strongly influenced by the simultaneous objectives of combining 1) a nimble grass-roots approach to code development with 2) strong version control to ensure model fidelity. This document is also influenced by the charge of the GCSC to enable model development and by the guidance document on the [Functioning of the GCSC](#). We hope that this discussion document can promote model development by the GC community.

1. Model developments are encouraged from across the GC community.
2. Developments are preferred if they are supported by the peer-reviewed literature.
3. Working group (WG) chairs engage with the GC community to identify priority developments for inclusion. This largely happens at the IGC# meetings, but continues outside the meeting.
4. Scientific developments should generally represent an objective improvement in simulating the state of atmospheric composition. Observations are useful to assess the degree of improvement.
5. Developments for which there is overwhelming evidence of missing processes should be considered for inclusion even if they degrade performance versus observations.
6. Developments generally should not substantially degrade other aspects of the simulation.
7. Priority developments benefit multiple groups across the GC community.
8. Observationally-driven developments are preferred if they have been linked to a known process.
9. Complex descriptions of processes that don't substantially impact the simulation should be avoided.
10. Developments which result in a model which is substantially more computationally burdensome should be avoided.
11. A development may be recommended as an option, rather than the default in the standard model, in cases where there are mixed opinions on the value of the development or in the case where the community supports multiple scientific options. However, the GCSC aims to limit the number of options in the standard version of the code to maintain the integrity of model version identity. Thus, multiple options are typically regarded as temporary, and following additional scientific investigation, will ideally transition to one accepted scheme in future releases.
12. Updates to the standard model should be submitted to the relevant WG, which meets physically every two years at GEOS-Chem meetings and more frequently (telecon, email) as needed. The WG recommends and prioritizes updates to the standard model, and the WG chairs then convey these recommendations to the GCSC for implementation.
13. The WG Chairs should as appropriate solicit additional input from the WG, or from the GCSC, to inform their recommendation.