Geoscientific
Model Development
Discussions

Interactive comment on "The generic MESSy submodel TENDENCY (v1.0) for process-based analyses in Earth System Models" *by* R. Eichinger and P. Jöckel

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I would like the authors to clearify some points. Most are related to how a user and developer would use TENDENCY. The questions are listed below as six questions. Each question needs a reply and some better explanation in the manuscript.

1) How much does TENDENCY depend on MESSY? Is TENDENCY a stand-alone tool which can be used in any computer-model which calculates physical tendencies?

Could it be ported to any weather forecast model (or even to a CFD model) or would it only work in the MESSY framework?

2) Can you explain better the closure test? The document says the user can give a list of variable/tendency pairs. How can the user assure that he/she has listed all the tendencies so that such a test makes sense.

Does the user have to know which tendencies he/she has to include in the list? How can the user know this?

3) Following up on the previous point. If a developers adds another, new sub-process (for example a new boundary layer mixing scheme..) How does the system assure that the closure tests work if the developer does not use the TENDENCY module?

4) Can you explain better how TENDENCY depends on operator splitting. For example if some processes are tightly interconnected and need to be solved implicitly (using a system of equations). Can then TENDENCY be of any help to take out the tendencies.

For example, assume some process involves rapid condensation and evaporation. The evaporation and condensation terms could be hidden in a system of equations, but the net tendency would be the difference in mixing ratio after and before the equation system is solved. How would you use TENDENCY to access the evaporation and condensation tendencies?

Another example can be individual production/loss rates from complex chemical reaction schemes. Would TENDENCY be able to output those rates?

5) As a developer using TENDENCY, how do you assure that you set the tendencies in the right unit? In section 2.3, you explain that sometimes the unit is dependent on the dynamical core. How would the sub-processes developer know which dynamical core is used?

6) As a developer using TENDENCY, do you need to take into account parallelization in any way? How do you make sure you write to/read from the right block of memory if the model is distributed using MPI or OpenMP?