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# BALANCED DATA ASSIMILATION FOR THE ATMOSPHERE

**Hastermann G.[1], Reinhardt M.[2], Reich S.[2] and Klein R.[1]**

[1] Freie Universität Berlin, Fachbereich Mathematik, Arnimallee 9, 14195 Berlin, gottfried.hastermann@fu-berlin.de
[2] Universität Potsdam, Institut für Mathematik, Campus Golm, Haus 9, Karl-Liebknecht-Str. 24-25, D-14476 Potsdam OT Golm

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The atmosphere's multi-scale structure poses several challenges in numerical weather prediction. A specific issue arises in the context of Bayesian data assimilation, where the balanced state of the atmosphere is not considered by the assimilation procedure in general. This inconsistency manifests in artificially triggering rapid internal waves although they should have negligibly small amplitude. These artificial fast waves then can have detrimental effects on the forecast quality as they interact on with the moist aerothermodynamics of the model.

We therefore investigate two different strategies to reduce these artificial oscillations, in the context of sequential Bayesian data assimilation. The first strategy directly modifies the posterior samples via a minimization problem. The second strategy modifies the first steps of the subsequent forecast to push back the ensemble members to the slow evolution. For this we propose to use certain asymptotically preserving integrators which can blend between a balanced and a unbalanced evolution model seamlessly.

This talk we will present numerical results and performance of the proposed methods for certain multi scale Hamiltonian systems with strong constraining force. Furthermore we will give an outlook how to implement the strategies for atmospheric flow models and present preliminary results for a rotational shallow water / vertical slice model.