

Progress using initial tendency and short-range forecast error methodologies

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Motivation + preliminary results from a perturbed physics ensemble.

Methodology overview

Future work



 500 models (ECHAM5) with perturbed cloud parameters (conservative).

Models are ranked according their ability to reproduce the climatology of cloud related variables.

- Every 10th model across the range of skill is selected for a double CO₂ simulation to find a relation between the ability of simulating the present-day climate and the response.
- Of those 50 models the 10 highest and lowest sensitivity models are selected for the evaluation of the short-term error with the use of data assimilation.







Cloud focused metric:

- Differences are due to clouds
- Cloud parameters are perturbed

Aggregated over standardized error :

- CRE_{SW}
- CRE_{LW}
- Precipitation
- Cloud cover





Present day!

















Vertically integrated absolute increments

CONTROL



ENTRAIN/5

Mean of 31 days X 4 forecasts per day X 12 timesteps per forecast. Mass-weighted vertical integrals. CONTROL model = 29R1,T159,L60,1800S.



RMS T1000 Increments: DUALM-CONTROL



Based on analysis Increments of T1000 20090715-20091031



- Are NWP methods useful to evaluate climate models and eventually better understand cloud feedbacks?
- Identify a case where an initial error has remote influence on the forecast error and finally on the simulated mean climate.

-> trace an initial error to its local and remote influences on different time-scales (hours, days -> climatology).





Assimilation increments (initial tendencies)

Transpose-AMIP

Mean climate state







• Hierarchy of model evaluation:

| Mean climate state | Months/Years | 1 |
|--------------------------------------|--------------|-----------------------------|
| Targeted metrics | Months/Years | |
| Transpose-AMIP | Days | |
| Assimilation increments | Hours | |
| Initial tendencies | Time-step | Error in cloud processes |



500 member perturbed parameter ensemble (1 year)50 models across the range skill (10 + 50 years)10 high and 10 low sensitivity models