Detection of forced response of the jet stream to global warming through machine learning

The North Atlantic jet exhibits large natural variability. Disentangling the forced response from natural variability is not trivial. In recent years, methods based on machine learning have been proposed for this task, for instance using a modified autoencoder, the Latent Linear Adjustment Autoencoder (LLAE; Figure 1a). The thesis will investigate the forced response of the jet stream to global warming in ICON idealized aquaplanet simulations, including a sea surface temperature (SST) anomaly (Figure 1b) with multiple configurations by using the LLAE.

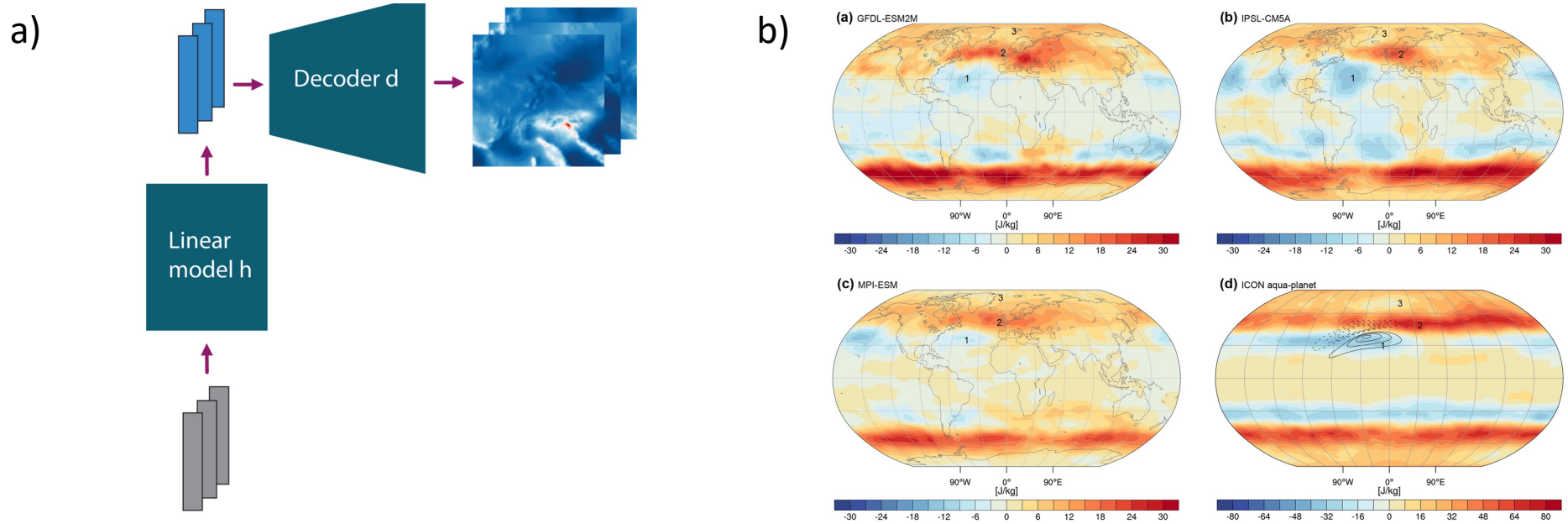

Figure1: a) Schematic design of the LLAE. A detrended field is used as input (gray) to a linear model, which predicts the latent space (blue). Then, the decoder predicts the output field based only on the detrended input. b) Zonal wind response at 250 hPa to uniform warming (shading) in an aquaplanet setup with an SST perturbation (green contours).

The **aims** of this thesis are:

- Detect the jet stream response produced by global warming in a baseline set of aquaplanet simulations with ICON.
- Analyze the sensitivity of the trend to the amplitude of the warming and/or characteristics of an SST perturabtion.
- Investigate the most relevant physical mechanisms responsible for the forced response.

Requirements: Interest in atmospheric dynamics, numerical modeling and machine learning. Basic knowledge or interest in scientific programming, ideally with Python.

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