Climate change detection based on smooth temporal patterns

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Detection is the process of demonstrating that an observed change is significantly different than can be explained by natural internal variability.

We introduce an original method for climate change detection, called Temporal Optimal Detection method, consisting in searching for a smooth temporal response pattern to a given forcing in observations. The temporal patterns are first evaluated non-parametrically from models outputs using a regularisation technique. Then the presence of the deduced patterns in the observations is inferred via a statistical test, assuming that the internal variability as the same properties than an AR1 process. This method allows to study the spatial distribution of the change, without providing any spatial guess pattern.

The efficiency of the method is illustrated by applying it on a real homogenised dataset of temperature over France. A multimodel detection is performed in this case, using an ensemble of Atmosphere-Ocean General Circulation Models for estimating the temporal patterns.