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Volcanic forcing in decadal forecasts

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Volcanic eruptions can significantly impact the climate system, by injecting large amounts of particles into the stratosphere. By reflecting backward the solar radiation, these particles cool the troposphere, and by absorbing the longwave radiation, they warm the stratosphere. As a consequence of this radiative forcing, the global mean surface temperature can decrease by several tenths of degrees. However, large eruptions are also associated to a complex dynamical response of the climate system that is particularly tricky do understand regarding the low number of available observations. Observations seem to show an increase of the positive phases of the Northern Atlantic Oscillation (NAO) the two winters following large eruptions, associated to positive temperature anomalies over the Eurasian continent. The summers following large eruptions are generally particularly cold, especially over the continents of the Northern Hemisphere. Overall, it is really challenging to forecast the climate response to large eruptions, as it is both modulated by, and superimposed to the climate background conditions, largely driven themselves by internal variability at seasonal to decadal scales. This work describes the additional skill of a forecast system used for seasonal and decadal predictions when it includes observed volcanic forcing over the last decades. An idealized volcanic forcing that could be used for real-time forecasts is also evaluated. This work consists in a base for forecasts that will be performed in the context of the next large volcanic eruption.