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Determining long range predictability in the presence of quasi-periodic climate variability: an example from the QBO

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How predictable the ocean-atmosphere system is on timescales from seasons to decades remains uncertain. Estimates of its predictability can be obtained only by running forecast verification cycles verifying against the observational record, or by running simulated forecast verification cycles verifying against model simulations to estimate "potential predictability". Both these are beset by the problem of distinguishing between the underlying chaotic prediction limits and model inadequacies. In this work we exam the long range prediction problem in the presence of quasi-periodic modes of variability, and the QBO in particular. We make the case that the main predictable elements are the inherent periodicity which is predictable a priori without the use of numerical simulation, so that to be considered skilful a numerical model must predict deviations from this periodicity. The extent to which such deviations are driven by tropospheric variability and hence long range prediction of the QBO variability is dependent on skilful prediction of the troposphere is examined.