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Quasi-Biennial Modulation of the Southern Ocean Coherent Mode

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We present the results of Empirical Orthogonal Function (EOF) analysis of two independent Southern Ocean sea level datasets for the period 1992-2002. We show that the coherent oceanic mode - a zonally symmetric counterpart to the atmospheric Southern Annular Mode (SAM) - consistently emerges as the predominant mode of variability and is a reliable proxy for circumpolar transport upon subannual to interannual timescales. Both the coherent mode and transport are shown to be modified by the stratospheric Quasi-Biennial Oscillation (QBO) and we describe a means by which QBO-dependant planetary wave activity may be guided from the stratosphere towards the surface by high-latitude easterly and westerly jets, inducing wind anomalies that force sea level variability through equatorwards Ekman transport. We use a longer time series of sea level estimations from an Ocean General Circulation model to show that QBO-induced sea level and transport variability may be modulated upon longer timescales by a quasi-decadal signal cycle of solar activity.