Arctic Oscillation Analyzed as a Singular Eigenmode of the Global Atmosphere

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In this study, eigenmodes and singular modes are analyzed for a dynamical system of the atmosphere linearized about a winter basic state in order to understand the dynamics of the Arctic Oscillation (AO). As a result of the analysis, we find multiple eigenmodes which are similar to the AO with a negative pole in the Arctic and positive poles in the Pacific and Atlantic sectors. Since some of the eigenmodes are unstable, a linear drag is introduced to shift the eigenvalues in order to pick up different eigenmodes as a singular mode with resonant behavior. It is demonstrated that the AO described by the neutral mode under the strong friction is recognized as the least damping mode excited by the tail of the resonant response curve of the singular eigenmode.