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The Nonlinear Relationship Between the Arctic Oscillation and Stratospheric Ozone

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An analysis of total ozone concentration as a function of the Arctic Oscillation Index (AO) was performed at all available stations. In particular, we looked for relationships between the two that were nonlinear in nature by performing a best fit of the total ozone concentrations to a quadratic function of the AO index. During the winter months (DJFM), a general negative correlation between the two variables was observed at stations between the latitudes of 40N and 70N. This can be explained by the AO's influence on ozone transport and depletion, but more likely is explained by the influence ozone concentration has on stratospheric temperature and in turn on the strength of the AO. However, if ozone concentration and the AO are indeed linked in both directions, then this would suggest a possible feedback mechanism which should manifest itself in a non-linear relationship between the two variables. We find such a significant quadratic relationship only in May at stations between 50N and 70N, primarily in Scandinavia and Russia. This may be related to a non-linear feedback relationships between the AO, late polar vortex breakup, and spring ozone chemistry.