# Supplement to "Stratospheric Sudden Warmings Impact Earth Rotation"

Lisa Neef, Sophia Walther, Kunihiko Kodera, Katja Matthes

June 13, 2014

The excitation of Earth rotation variations by atmospheric angular momentum is given by the following six excitation functions:

$$\chi_1^{\mathrm{M}} = \frac{-1.10R^4}{(g(C-A))} \int\int p_s \sin\phi \cos^2\phi \cos\lambda \mathrm{d}\lambda \mathrm{d}\phi \quad (1)$$

$$\chi_1^{\mathrm{W}} = \frac{-1.61R^3}{\Omega(C-A)g} \int\int\int (u \sin\phi \cos\phi \cos\lambda - v \cos\phi \sin\lambda) \mathrm{d}\lambda \mathrm{d}\phi \mathrm{d}p \quad (2)$$

$$\chi_2^{\mathrm{M}} = \frac{-1.10R^4}{(g(C-A))} \int\int p_s \sin\phi \cos^2\phi \sin\lambda \mathrm{d}\lambda \mathrm{d}\phi \quad (3)$$

$$\chi_2^{\mathrm{W}} = \frac{-1.61R^3}{\Omega(C-A)g} \int\int\int (u \sin\phi \cos\phi \sin\lambda + v \cos\phi \cos\lambda) \mathrm{d}\lambda \mathrm{d}\phi \mathrm{d}p \quad (4)$$

$$\chi_3^{\mathrm{M}} = \frac{0.748R^4}{C_m g} \int\int p_s \cos^3\phi \mathrm{d}\lambda \mathrm{d}\phi \quad (5)$$

$$\chi_3^{\mathrm{W}} = \frac{0.997R^3}{C_m \Omega g} \int\int\int u \cos^2\phi \mathrm{d}\lambda \mathrm{d}\phi \mathrm{d}p. \quad (6)$$

The trigonometric weighting functions that are applied to the individual wind and pressure fields are illustrated graphically in Figures 1 - 3.

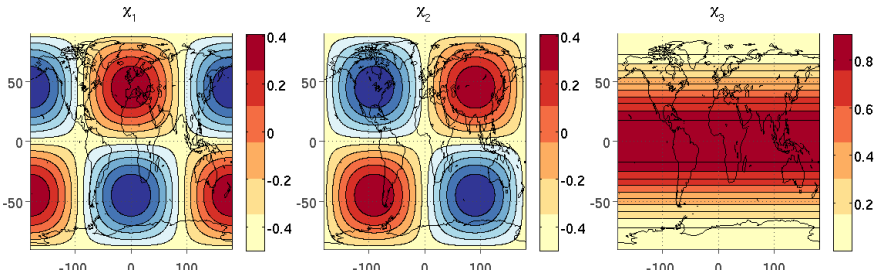


Figure 1: The trigonometric functions that weight zonal wind in each of the three AAM excitation functions.

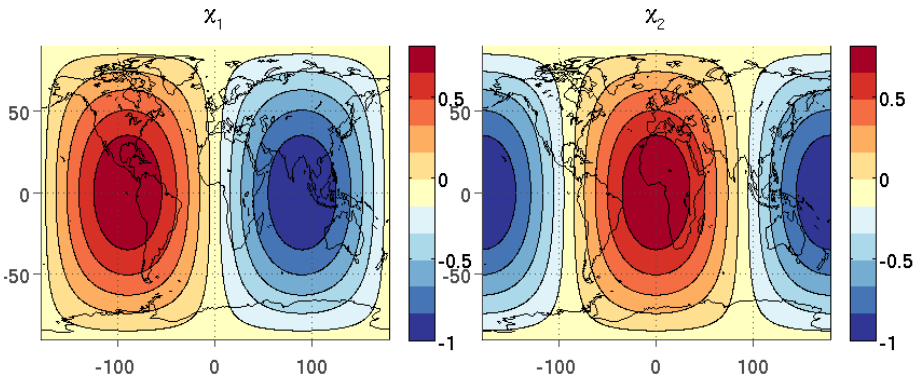


Figure 2: The trigonometric functions that weight meridional wind in each of the three AAM excitation functions.

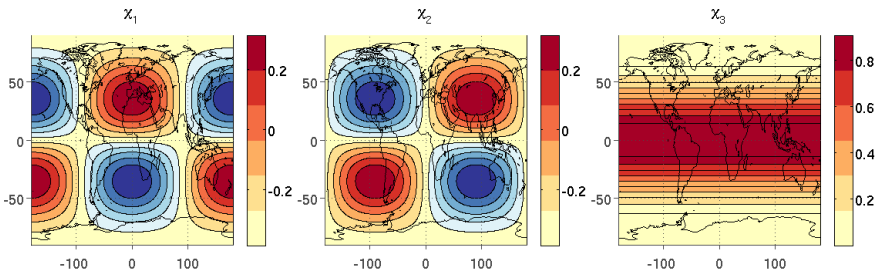


Figure 3: The trigonometric functions that weight surface pressure in each of the three AAM excitation functions.