Inter-annual variations of Martian seasonal cycle from longstanding neutron spectroscopy observations onboard Mars Odyssey. M.L. Litvak[1], I.G. Mitrofanov[1], A.B. Sanin[1], W.V. Boynton[2], [1]Space Research Institute, RAS, Moscow, 117997, Russia, litvak@mx.iki.rssi.ru, [2]University of Arizona, Tucson, AZ 85721, USA.

Introduction: Starting from 2002 Mars Odyssey passed through the multiple extended missions accumulating unique science data volume covered about 15 years of continuous operations. During this period of time global orbital mapping of Mars neutron flux variations (GRS instrument with HEND and NS subsystems) was successfully used for the deduction of water ice distribution [1-3, 5] as well for longstanding monitoring of martian seasonal caps [4-8] including their local and global variations with time.

Data Analysis: The growing and sublimation of martian snow caps is seen as seasonal variations of neutron flux above Martian polar regions. At near polar latitudes difference in neutron flux value between summer and winter seasons may achieve up to one order of magnitude. It provides possibility to use neutron data as a sensitive method to monitor behavior of seasonal caps and search their inter annual variations on the time scale of 8 martian years. Counts in neutron detectors could be converted to such parameters as column depth (g/cm^2) and mass (kg) using numerical modeling of neutron production and scattering in martian subsurface (including seasonal CO_2 deposits) and atmosphere.

Using all available HEND/GRS/Odyssey data (from 2002 until now) we summarized results of multiyear observations of seasonal variations of atmospheric CO_2 within one seasonal cycle, compare variations between successive seasonal cycles and compare experimental data with climate models predictions. The time history of CO_2 frost column density variations within one seasonal cycle is illustrated on the Figure 1. It is derived from HEND/GRS/Odyssey data and resulted time profile shown on the figure is averaged for all martian years. The inter-annual variations are illustrated on Figure 2. It shows inter-annual behavior of CO_2 frost accumulation at the selected latitudes in the middle of southern winter.

References: [1] Feldman W.C. et al., (2002), *Science*, 297, 5578, 75-78. [2] Mitrofanov I.G et al. (2002), 297, 5578, 78-81. [3] Boynton W.V. et al., (2002) *Science*, 297, 5578, 81-85. [4] Mitrofanov I.G. et al., (2003) *Science*, 300, 2081-2084. [5] Litvak M.L. et al. (2006) *ICARUS*, 180, 1, 23-37. [6] Kelly N. J. et al (2006) *J. Geophys. Res*., E03S07. [7] Litvak M.L. et al., (2007) *J. Geophys. Res*., E03S13. [8] Prettyman T. H. et al., (2009) *J. Geophys. Res*., 114, CiteID E08005.

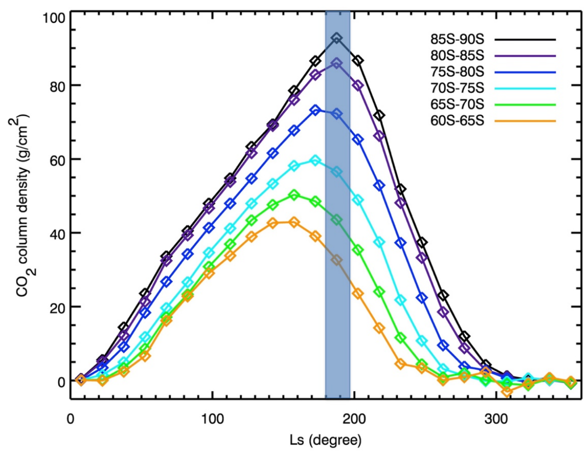

Figure 1. Seasonal variations observed at different southern latitudes within one seasonal cycle.

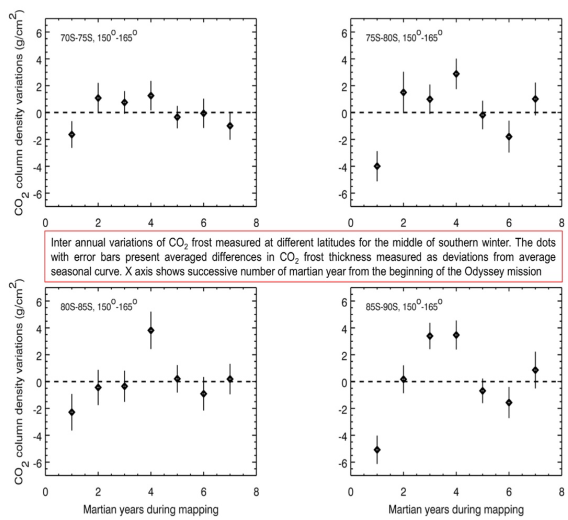

Figure 2. The illustration of inter-annual variations of CO_2 frost measured at different latitudes for the middle of southern winter (see blue area on Figure 1). The dots with error bars present averaged differences in CO_2 frost thickness measured as mean deviation between given seasonal curve and average seasonal curve.