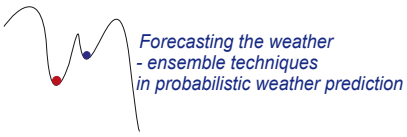
EMS Annual Meeting Abstracts
Vol. 8, EMS2011-858, 2011
11th EMS / 10th ECAM



Solar forcing of the Venus, Mars and the Earth's atmosphere: A comparison

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The Sun is the ultimate climate driver for the Terrestrial planets - Earth, Venus and Mars. The Terrestrial planets display commonalities in composition, size, and proximity to the Sun, but they are characterized by widely different atmospheric and climatic conditions. Compared to the Earth, the atmospheric composition, temperature, and surface pressure on Venus and Mars are much different. Venus and Mars are arid planets with atmospheres dominated by a greenhouse gas CO_2 ($> 95\%$), while the Earth's atmosphere is dominated by molecular Nitrogen and Oxygen. The main greenhouse gas in the Earth's atmosphere is water, with a minor contribution of CO_2. Bearing these differences in mind, what can we possibly learn from Mars and Venus about the solar influence on the Earth's atmosphere? The answer can be found in how solar forcing affects a planetary atmosphere, more specifically the impact of solar EUV and solar wind variability on a planetary atmosphere. New information from ESAs Mars Express and Venus Express orbiters show that long-term, but also short-term, solar forcing has implications for the atmospheric evolution and climate on Mars and Venus. Short-term space weather effects on the Earth's tropospheric circulatory system have been reported, but their effects on the large-scale system are usually rejected. However, new data from Mars and Venus shows that variable EUV and solar wind forcing from the Sun may have profound long-term, as well as short term implications for a planetary atmosphere, let alone the evolution of planetary climate.