



Lead Author e-mail: lixu@cola.iges.org

Title: *snow atmosphere interactions: coupling strength and potential predictability*

Li Xu^{1,2}

¹*Center for Ocean-Land-Atmosphere Studies*

²*George Mason University, USA*

This study investigated the snow-atmosphere coupling strength (the degree to which atmosphere responds to anomalies in the snow cover and their subsequently interaction) and its contribution to short range climate predictability, based on the realistic snow information from the MODIS snow retrieval from NASA satellites and GLDAS land "reanalysis" data. A complex land surface model (CLM 3.5) with an advanced snow scheme coupled to the Community Atmospheric Model (CAM) was employed to quantify continental snow-atmosphere coupling strength. A series of ensemble experiments were designed to investigate the snow albedo effect and hydrological effect separately. A recently derived index Ω was used to quantify the coupling strength and predictability estimated separately by the phase and shape characteristics of a forecast ensemble. In addition, the climate predictability represented by Signal-to-Total Ratio (STR) due to realistic snow information, including Snow Water Equivalent (SWE) and Snow Cover Fraction (SCF), are also investigated. This study improved our understanding of the interaction between snow cover and atmosphere. Determining the seasonal forecast skill attributed by snow information also increased our knowledge of climate predictability. These experiments would also offer a prototype for testing snow-atmosphere coupling strength that could be implemented in other weather and climate models in the future.