

# Step 5: Sun-Solar System Connection Roadmap

## Targeted Outcome to Capabilities to Implementation

*Targeted Outcome: Phase 2015-2025, Understanding Our Home*

### **Climate Responses to Solar Variability**

#### **Required Understanding**

Interactions among reactive species in middle atmosphere in response to solar variability

Development, persistence, and decay of stratospheric circulation anomalies

Downward propagation of circulation anomalies into troposphere

Variations and secular changes in stratospheric and tropospheric polar vortex

Upward propagation of climate variability into middle and upper atmosphere, with consequent effects on circulation and wave dynamics

UV effects on ecosystems

Changes in reactive and GH gases

Changes in surface energy budget

Variations in clouds, temperatures, the hydrologic cycle, and winds

#### **Enabling Capabilities & Measurements**

Continuous observations of high-frequency responses of atmospheric composition to varying solar input

Vertical profiling of chemical variations in the middle atmosphere

Stratosphere-troposphere coupling in polar vortex?

Accurately-calibrated planetary albedo at high spatial and spectral resolution

Highly-resolved budgets of surface emissions of radiatively-active gases

Continued observations of the high-frequency variability of surface and tropospheric climate

#### **Implementation Phase 2: 2015-2025**

**Model Development:**  
Whole Atmosphere GCM with coupled land, oceans, and chemistry

**New Strategic Missions:**  
L1 and L2 for continuous global obs

**New Explorer Missions:**  
Profiling (active) laser spectrometry

**Theory Programs:**  
Radiation, Hydrology, and Life;  
EPP and clouds;  
Strat-trop coupling