During the recent solar minimum period, the importance of high speed streams and their effect on the thermosphere and ionosphere has been discovered. Most attention has been given to the quasi-nine day recurrence of geomagnetic activity that drives a corresponding response in the global thermosphere and ionosphere.

In this talk, we summarize progress over the past few years, including observations and modeling studies. These results show that the global thermospheric neutral density and composition respond in a way that indicates the importance of the quasi-periodic high latitude drivers. Similarly, the global ionospheric F-region electron density and height respond consistently with the neutral gas response. These responses have been observed repeatedly and by various techniques throughout the recent solar minimum. They have also been simulated with global models. While the periodicity ranges from 7-9 days, this repeatability and consistency indicate a way forward in the prediction of thermospheric and ionospheric parameters several days into the future, especially during solar minimum conditions.

In addition to summarizing the progress in the field, this talk will attempt to make connections to the structure of high speed streams and IMF parameters and to related magnetospheric responses. The talk will pose questions to other disciplines that might help understand the chain of events that leads from the sun to the ionosphere.