Climate Prediction: Standards of proof and the ’hard part’

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We are in a difficult time in the study of climate, particularly the science of climate prediction. The difficulty arises because we are just at the beginning of the time when our ability to predict climate is satisfying both our curiosity about, and our desire for practical knowledge, about the future. There are accomplishments. The IPCC has directly addressed the ’detection and attribution’ problem. Climate change has been detected and anthropogenic emissions of greenhouse gases have played a key role in the change. This however is not enough.

There are two paths forward that we need to understand are critical. The first path forward consists of facing two very hard problems. The first is establishing an understanding the sensitivity of the climate system to greenhouse gas changes. The second is the need to be able to predict climate impacts on a regional scale. Recent efforts in the community have established that the best, if not the only way to address these problems is through the use of large computational models.

This latter point sharply constrains the second path. That path involves the continuing effort to identify those forces that might be affecting the climate beyond the standard set of ideas. The standard has been set that these other forces, such as extra-terrestrial impacts on cloud cover must be investigated to obtain quantitative process information that can be integrated into these models. At a minimum the hypothesized mechanisms must be framed in terms of testable hypotheses observable in the lab or in the field.