It is important to understand when a change to the climate can be attributed to global warming or whether it is still in the realms of natural variability. While this is difficult within the short record of observations we can address this issue within the framework of climate models.

The CMIP3 multimodel dataset provides time series of control runs that have been executed without external green house forcing. These runs allow us to explore the full range of a model's internal climate variability. This unforced variability can be directly compared to the greenhouse forced runs to determine at what point we can confidently attribute a change to global warming rather than to the natural variability of the system.

The time at which the variability of the forced model run (20C3M/SRES) continually exceeds the long-term (>500 years) PICNTRL variability “envelope” is termed the "time of emergence" (TOE). The analysis is applied to both surface temperature and precipitation.

When considering temperature the tropical regions emerge before the poles. The reverse is true of precipitation where the midlatitudes emerge before the subtropical regions. Spatial patterns of TOE for temperature show regional hotspots where emergence is not until late in the 21st century due to the large internal variability signal.