Solar geoengineering aims to reflect some sunlight back to space, with the goal of reducing some of the risks associated with climate change. The best understood of these approaches is to add aerosols to the stratosphere. While we know this would cool the planet, we do not yet understand how to design strategies that would minimize important risks of geoengineering. There are many reasons for concern, ranging from “winners and losers” that might result from regional inequalities (i.e., who gets to set the thermostat?) to the irreducible uncertainty regarding the climate effects (how do we engineer a system that we don’t understand?) However, geoengineering is at least in part a control problem, and engineering tools can help – from optimization that minimizes regional differences, to feedback that helps manage outcomes despite uncertainty. The use of feedback makes this, quite literally, the world’s largest control challenge!

Time permitting, I will discuss several other applications from my research, applying tools and ideas from engineering feedback analysis to climate science, including system identification, and using feedback as a tool in climate model analysis.

Biographical sketch

Douglas MacMartin is a Research Professor in Computing + Mathematical Sciences at the California Institute of Technology, and from 2008-2014 also a visiting scientist at the Carnegie Institution (on Stanford campus). In addition to applying engineering analysis to climate dynamics, he is involved in control design for the Thirty Meter Telescope (TMT). He received his PhD in Aeronautics and Astronautics from MIT in 1992; prior to joining Caltech in 2000, he led the active control research and development program at United Technologies Research Center.