Séminaire 25 Janvier 2013 11h / Seminar January 25th 2013 11h

Conférencier/Lecturer: Shaun Lovejoy (McGill Uni., Physics Department/Département de physique)

Sujet/Subject: The climate is not what you expect

Lieu/Room: Salle des vents (Dorval)

wiki: https://wiki.cmc.ec.gc.ca/wiki/RPN_Seminars

iweb: http://web-mrb.cmc.ec.gc.ca/mrb/rpn/SEM/
web: http://collaboration.cmc.ec.gc.ca/science/rpn/SEM/index.php

Résumé/Abstract

Prevailing definitions of climate are not much different from "the climate is what you expect, the weather is what you get". Using a variety of sources including reanalyses and paleo data, and aided by notions and analysis techniques from Nonlinear Geophysics, we argue that this dictum is fundamentally wrong. In addition to the weather and climate, there is a qualitatively distinct intermediate regime extending over a factor of ≈ 1000 in scale. For example, mean temperature fluctuations increase up to about 5 K at 10 days (the lifetime of planetary structures), then decrease to about 0.2 K at 30 years, and then increase again to about 5 K at glacial-interglacial scales. Both deterministic GCM's with fixed forcings ("control runs") and stochastic turbulence-based models reproduce the first two regimes, but not the third. The middle regime is thus a kind of low frequency "macroweather" not "high frequency climate". Regimes whose fluctuations increase with scale appear unstable whereas regimes where they decrease appear stable. If we average macroweather states over periods ≈ 30 years, the results thus have low variability. In this sense, macroweather is what you expect. We can use the critical duration of ≈ 30 years to define (fluctuating) "climate states". As we move to even lower frequencies, these states increasingly fluctuate - appearing unstable so that the climate is not what you expect. The same methodology allows us to categorize climate forcings according to whether their fluctuations decrease or increase with scale and this has important implications for GCM's and for climate change and climate predictions.