

## Bio, Shaun Lovejoy, April 2019

Following a B.A. and M.A. in theoretical physics from Trinity College, Cambridge, in 1981 Shaun Lovejoy earned his PhD in Physics from McGill University, Montreal (Canada). He has been on faculty at McGill since 1985 and is currently a professor of physics.

The beginning of Lovejoy's career coincided with the nonlinear revolution. Following his discovery of wide range scaling (fractality) in cloud images (*Science*, 1982), he began a long collaboration with colleague Daniel Schertzer. Together, they developed and applied scaling ideas in the geosciences, contributing to the explosive growth of nonlinear geophysics including the modeling and empirical analyses and characterization of geosystems over wide ranges of scales. The most important advances of this period include cascades as the generic multifractal process, generalized (anisotropic) scale invariance, universal multifractals, (causal) space-time multifractal modeling of geofields and the establishment of wide range scaling in the horizontal and vertical directions as well as in time.

In 2013 Lovejoy showed that the conventional weather - climate dichotomy had to be replaced by the trichotomy of weather - macroweather - climate and in 2015 he pointed out that the standard scalebound paradigm underestimated atmospheric variability by a factor of a quadrillion ( $10^{15}$ ). He has also shown how scaling can be used to make more accurate macroweather ("long range") forecasts (the STOChastic Seasonal and Interannual Prediction System; StocSIPS) as well as climate projections to 2100 that have much smaller uncertainties than conventional models.

Many of these developments are reviewed in his monograph *The weather and climate: emergent laws and multifractal cascades*, (with D. Schertzer, 496pp, Cambridge University Press, 2013). In addition, an up to date non-specialist survey of this scaling paradigm in atmospheric and climate science *Weather, macroweather and the climate: our random yet predictable atmosphere* (334pp, Oxford University Press, 2019) has recently appeared. Lovejoy has published over 200 journal papers, 3 books and over 60 book chapters. Other application areas include hydrology, precipitation, floods and river networks, topography, geogravity, geomagnetism, volcanic activity, earthquakes and biogeosystems.

Lovejoy's work is widely cited (Google scholar: 14400 citations, h-index=57, ISI h-index: 44). He is the highest cited person with keyword "multifractal" and the fourth highest with the keyword "fractal".

In 1989, Lovejoy co-founded the Nonlinear Processes in Geophysics scientific division at the European Geosciences Union (EGU) and in 1994 he was founding co-editor of the joint AGU-EGU journal *Nonlinear Processes in Geophysics*. From its inception in 1997, was an active member of AGU's Nonlinear Geophysics (NG) focus group of which he was Vice-president (2006-2008), then President (2008-2012). From 2013-2016, he was president of EGU's Nonlinear Processes in geophysics division. In 2015 he gave the NG focus group's Lorenz Lecture and in 2016 he became an AGU fellow. In 2016, he was named Fessenden professor at McGill University. In 2019 he was awarded the EGU's Richardson medal.