Seeing beyond the invisible: Scientists find formula to uncover our planet's past and help predict its future

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Mustelid predator

(PhysOrg.com) -- Studies of climate evolution and the ecology of past-times are often hampered by lost information - lost variables needed to complete the picture have been long thought untraceable but scientists have created a formula which will fill in the gaps of our knowledge and will help predict the future.

A novel method of reconstructing missing data will shed new light on how and why our climate moved us on from ice ages to warmer periods as researchers will be able to calculate lost information and put together a more complete picture.

Similarly they will be able to tackle ecological studies that are currently

incomplete or distorted. Why do populations of animals like rabbits and foxes fluctuate so dramatically? Which factors most heavily influence population decline and, eventually, lead to extinction?

Published in the June issue of New Journal of Physics the paper 'Recovering "lost" information in the presence of noise: Application to rodent-predator dynamics' offers a solution to the problem of reconstructing missing or lost information in studies of dynamical systems such as the Earth's climate or animal populations.

It could potentially uncover new findings on topical scientific issues such as climate change and the extreme population fluctuations in some animal species.

By developing a novel Hamiltonian approach to the problem, using a mathematical algorithm, assuming the dynamics of each system has unknown parameters and that the data are distorted by random fluctuations, the researchers from California and Lancaster were able to successfully recreate measurements in a study on a vole-mustelid community.

Many small mammalian species have cyclic population dynamics, periodically oscillating between large and small communities, a behavioral phenomenon which has puzzled ecologists for decades. Reconstructed data on such predator-prey dynamics could now give new insight into why some species suddenly decline.

Climate evolution is subject to similar cyclical variations, which could be uncovered by applying the method to measuring the distribution of isotopes in sediments taken from the ocean floor, potentially giving further insight into the reasons behind climate change.

As the researchers write, "The method will also be applicable quite

generally to cases where some state variables could not be recorded." These could include, not only climate change and ecology, but also contexts such as populations at risk from epidemics and rocket motors for new space crew exploration vehicles.

More information: Journal paper: www.iop.org/EJ/abstract/1367-2630/11/5/053012/

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