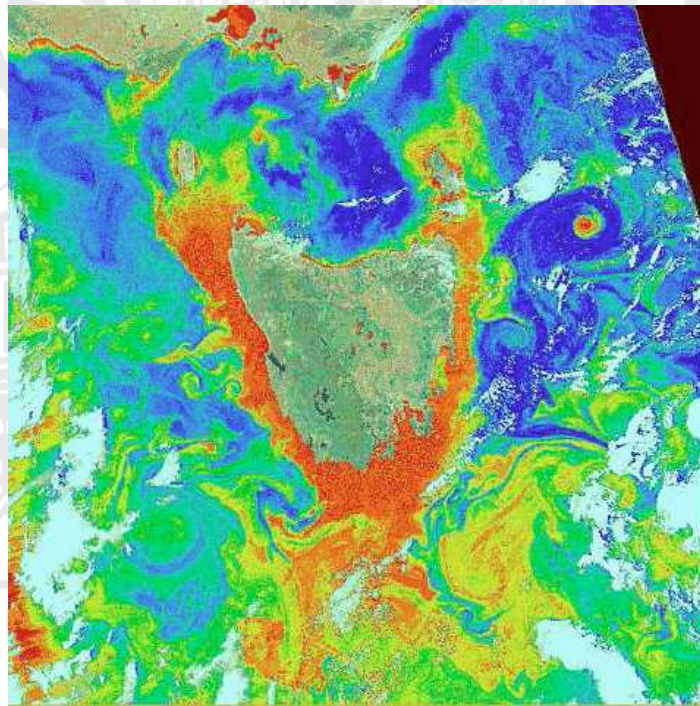# PHYSIKALISCHES KOLLOQUIUM

AM 04. JULI 2011 UM 17 UHR C.T.

IM GROßEN HÖRSAAL

FRACTAL SKELETONS:
THE UNIVERSALITY IN DEATH BY STARVATION

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Nature is permeated by phenomena in which active processes, such as chemical reactions and biological interactions, take place in environmental flows. They include the dynamics of growing populations of plankton in the oceans and the evolving distribution of ozone in the polar stratosphere. I will show that if the dynamics of active particles in flows is chaotic, then necessarily the concentration of particles have the observed fractal filamentary structures. These structures, in turn, are the skeletons and the dynamic catalysts of active processes, yielding an unusual singularly enhanced productivity. I will argue that this singular productivity could be the hydrodynamic explanation for the plankton paradox, in which an extremely large number of species are able to coexist, negating the competitive exclusion principle that asserts the survival of only the most perfectly adapted to each limiting resource. By including finite-size effects, I will define a stochastic description supported on the natural measure of the attractor to show that the death kinetics assume a universal behaviour exhibiting a 1/t decay law in the population, which becomes distributed on a subset characterised by the correlation dimension of the chaotic flow.