Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07909, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07909
EGU General Assembly 2008

Application of finite and infinite dimensional Nambu mechanics in dynamic meteorology

A. Bihlo

University of Vienna, Department of Meteorology and Geophysics

Nambu mechanics is a very young but powerful discipline. It is aimed to generalise the ideas of classical Hamiltonian mechanics that one conserved quantity (typically the total energy) together with the antisymmetric Poisson structure describes the dynamics of a conservative system. Nambu mechanics allows to elegantly include additional conserved quantities along with higher-order antisymmetric structures. Nambu mechanics was originally proposed for point-mechanical systems solely and have been studied more and more during the past 30 years.

However, in the mid 1990s P. Nevir and R. Blender found that a large set of hydrothermodynamical models can be cast in a continuous Nambu-like form also if additional conserved vorticity quantities (entrophy, potential enstrophy and helicity) are included in the description of the standard fluid systems (Energy-vorticity-theory).

In this presentation we plan to give an idea of the link between discrete and continuous Nambu mechanics and discuss similarities as well as differences of both forms. Examples are the barotropic vorticity equation and the famous Lorenz systems. This link is of some importance since it allows one to investigate how to construct low order models (LOMs) which maintain the intrinsic structure of geophyical fluid dynamics. Furthermore, such an investigation helps to reveal which of the well-established facts on point-mechanical Nambu systems can be carried over to the much more involved continuous case. This in turn has potential applications in nonlinear dynamics and chaos theory, as well as for the principle understanding of atmospheric flows.