

**Note on appearance of zigzag type self similarity in flying bird flocks performing directional collective motions in mild-weather conditions**

Adam Gadomski, Janusz Cyran

It is argued here that very regular and coordinated patterns of bird flocks in motion, in quiescent weather conditions, can be expected to first emerge upon minimal configurational entropy production for the flock(s) vs. air mass couple. This is immediately to accept if certain ultralow friction conditions apply, with the air-bird flock friction coefficient  $f$  approaching minimal values. Then, quite geometrically coordinated, apparently self-similar zigzag type patterns show up during the flock's motion. Otherwise, the coherence of the flying patterns is lost, the flocks become disorganized, characteristic of fairly large configurational-space (individual positions involving) entropy, and their average acceleration supposedly gets on appreciable nonzero values. The oversimplified analysis performed in this study does not assume really far-from-equilibrium (thermo)dynamic conditions to occur.