Numerical simulations of “small” eddies formation in the atmosphere

A.E.Pokhil

The Hydrometcentre of Russia,
123242 Moscow, Russia, B. Predtechenskiy per. 11-13.
E-mail: pokhil@mecom.ru

Some cases of occurrence and interaction between “small” eddies are considered in this paper. It can be exemplified by vapor eddies observed in the atmosphere on the border between large vortex formations. Another example of formation of “small” eddies took place during the interaction of two typhoons over the Pacific Ocean. The satellite imagery provides a clear picture of the occurrence of “small” eddies between two closely (as compared to the size of a tropical cyclone) adjacent typhoons. The formation of “small” eddies was observed also in the eye of a storm.

Numerical experiments with the assemblies of the finite size distributed eddies corresponding to the situations in the real atmosphere are carried out using model [1].

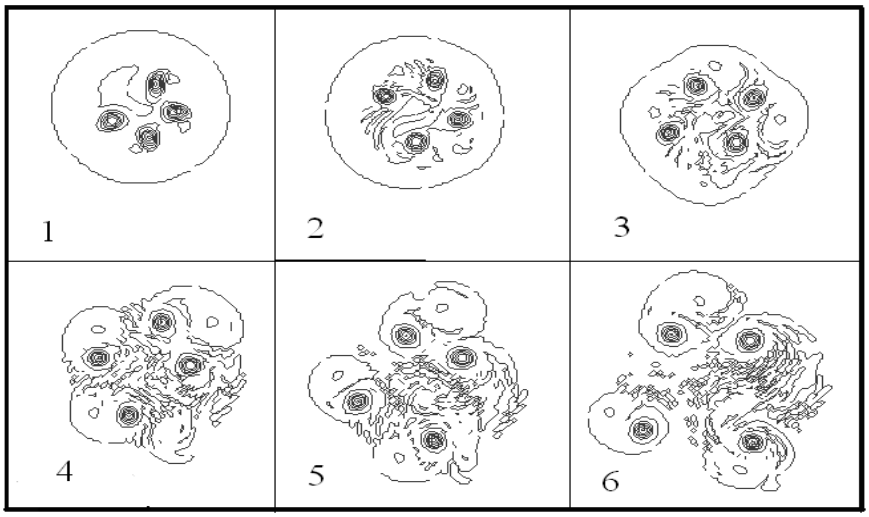
Based upon the model, the occurrence of secondary “small” eddies was observed during the interaction of a pair of cyclone and anticyclone eddies as well as of a pair consisting of a cyclone vortex and an anticyclone vortex.

The results of numerical experiments with the groups of two-five eddies demonstrated the formation and evolution of secondary “small” eddies. The examples are illustrated in Figures 1-2.

It was derived that the formation of “small” eddies takes place in the area between two vortex structures of different or similar nature under certain correlations of the moments of momentum, energy and velocity profile gradient decline in the initial eddies.

The criteria for occurrence of “small” eddies, as well as an option for assessment of the quantity and mass of the formed “small” eddies based upon the laws of conservation of mass, angular momentum and energy are suggested. It is assumed that these situations serve as examples of energy transfer from large scale to small one.

1.Pokhil A.E., Sitnikov I.G., Zlenko V.E. Investigation of interaction of atmospheric vortexes by a numerical model.-2010: Energy:Economic, Technique, Ecology. № 1, p.35-41.



a

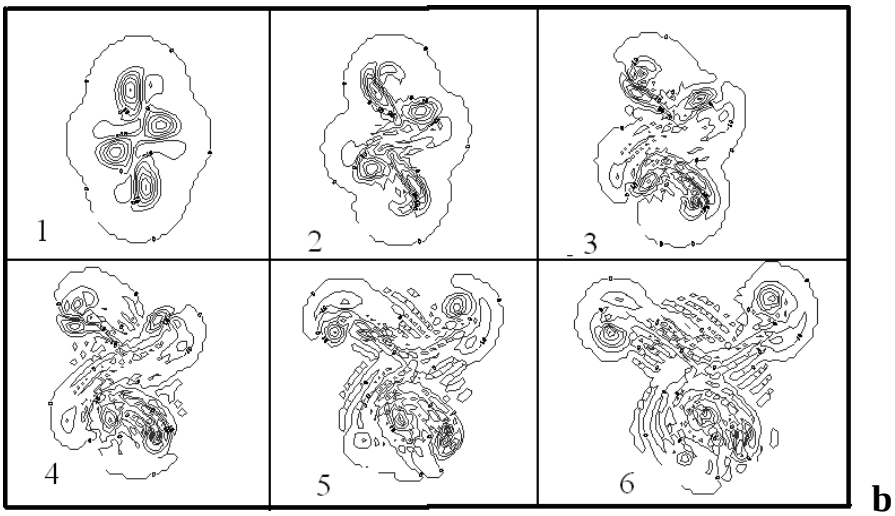


Fig.1. The dynamics of two different systems (a and b) of four interacting eddies of various intensities and distances between the centers simulated by the model.

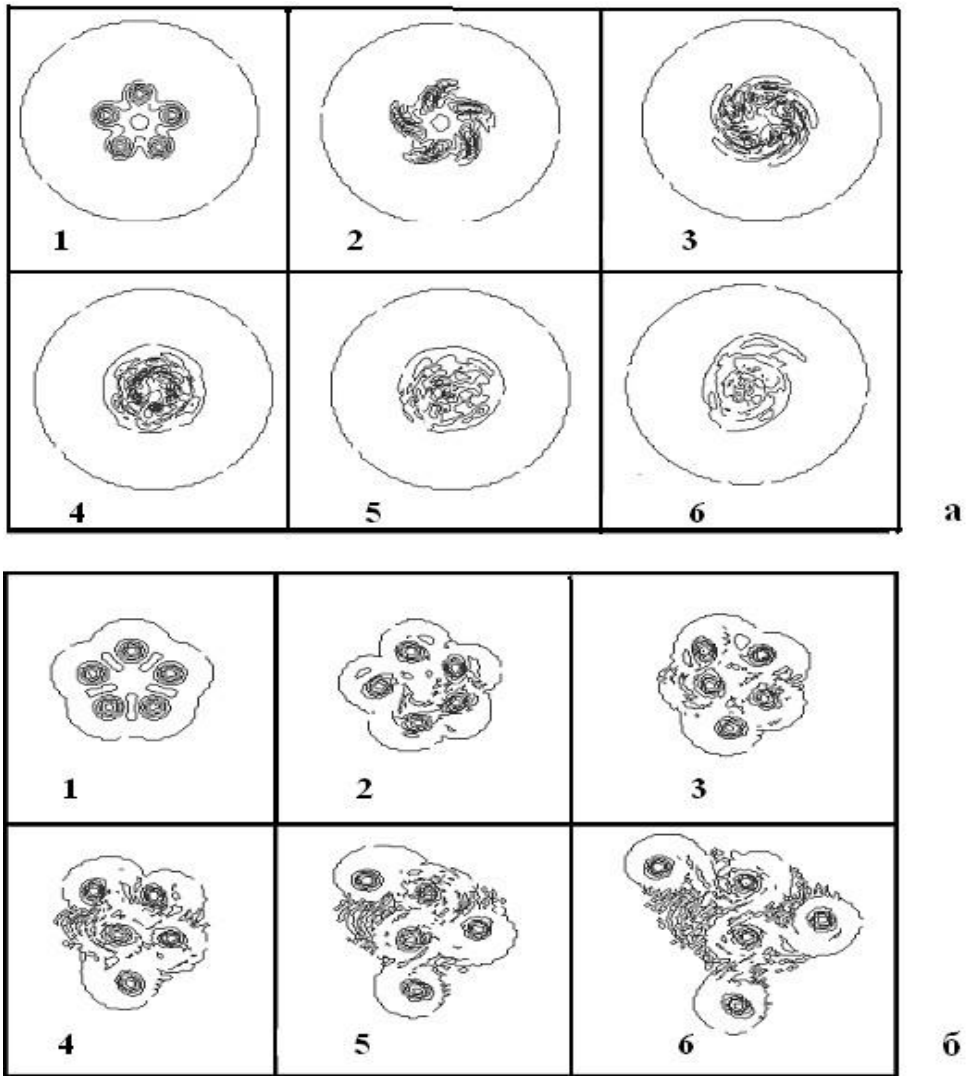


Fig.2. The dynamics of two different systems (a and b) of five interacting eddies with different distances between their centers and intensity correlations simulated by the model.