Parallel implementation of local ensemble Kalman filter for atmospheric data assimilation

© V.G. Mizyak, A.V. Shlyaeva, M.A. Tolstykh

Hydrometeorological Center of Russia, Moscow, 123342, Russia

One of major ways to reduce the errors in numerical weather prediction is the improvement of the atmospheric state estimate. This estimate is used as initial data for a prognostic model. The computational complexity of the data assimilation algorithms dictates the necessity for efficient parallel implementation. In this work, a parallel implementation of the local ensemble transform Kalman filter data assimilation scheme is discussed. The results for the speed-up and efficiency of the parallel implementation are presented. It is shown that a non-uniform distribution of the parallel workload between the processes restricts the efficiency of the parallel algorithm. Approaches to solving this problem are suggested.

Keywords*: parallel algorithm, ensemble Kalman filter, data assimilation.*

Mizyak V.G. graduated from the Fundamental Sciences Department of Bauman Moscow State Technical University in 2007. Software Engineer at the short-range weather forecast department of the Hydrometeorological Center of Russia. Author of 3 papers on parallel computing and data assimilation. e-mail: vmizyak@gmail.com

Shlyaeva A.V. (b. 1984) graduated from the Software and Information Technologies Department of Bauman Moscow State Technical University in 2007. Ph.D., Assoc. Professor of the Software and Information technologies Department, Senior Scientist of the Hydrometeorological Center of Russia. Author of 15 papers. Interested in mathematical modeling, statistical data analysis, parallel computing. e-mail: shlyaeva@gmail.com

Tolstykh M.A. (b. 1963) graduated from the Moscow Institute of Physics and Technology in 1986. Dr. Sci. (Phys. & Math.), Leading Scientist of the Institute of Numerical Mathematics of the Russian Academy of Sciences, Head of laboratory of Hydrometeorological Center of Russia. Author of 68 papers. Scientific interests: numerical methods in geophysical hydrodynamics, numerical weather prediction, parallel computing. e-mail: tolstykh@inm.ras.ru