CONTRADICTIONS IN MODERN CLIMATE THEORY AND THEIR SOLUTION

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The modern climate modeling with general circulation models of the atmosphere and the ocean leads to two contradictions. If we consider the climate in terms of synergy, these contradictions can be eliminated. Shows one of the ways to resolve conflicts through the use of systemic approaches synthesis. Shows the solution for the two scales. Total system can contain about 50 equations (about hundreds of empirical parameters).

Modern theories of a climate we name modeling of a climate by means of models of the general circulation of atmosphere and ocean as now it is considered to be these models the main direction of development of a world science about a climate. We will consider two main contradictions and ways of their permission.

Contradiction 1. On the one hand the climate is understood as not observable fluctuation of a global condition of atmosphere, characteristic which time scale essentially more than characteristic time of synoptic fluctuations [3]. Hence, climatic fields should correspond with fields of synoptic scale as processes net and подсеточного scale. From here follows that at modeling of a climate entry conditions should characterize a climatic field, free (whenever possible) from fluctuations of synoptic scale. On the other hand, in practice initial fields are used the same, as at a weather forecast [1], therefore the decision of system of the equations of circulation of atmosphere and ocean gives only a field of synoptic fluctuations. Procedure of averaging which results in the second contradiction is applied to definition of climatic fields.

Contradiction 2. On the one hand for a long time already have come to a conclusion that the climate changes in time. On the other hand it agree эргодической to a hypothesis a climate it is defined as average value of results of integration (statistical ensemble) for 30 years, i.e. on this interval it is constants. As practice nevertheless demands to estimate climate change climate change is estimated on deviations from a climate that leads to the logic contradiction.

Climate forecasting can’t be effective until both specified contradictions will be eliminated. That them to resolve, it is enough to refuse climate definition as statistical ensemble of conditions for 30 years, and to understand a climate as average values on some ensemble of inwarinesses of atmosphere under constant external conditions [3].

This definition leads to climate interpretation as to the usual equilibrium thermodynamic characteristic at which the specified contradictions can’t simply arise. Can seem that such definition is not constructive as real atmosphere represents open nonlinear nonequilibrium system for which variable conditions to thermodynamic system in a sense are conditional.

However in many real systems thermodynamic balance is fair for elementary volumes (local balance) [9], i.e. variable conditions (pressure \( P \) and temperature \( T \)) are functions of spatial coordinates \( x \) and time \( t \). If the elementary volume is much more than size of fluctuations values of variables of a condition can be defined by statistical averaging on elementary volume.

At the description of a climate fluctuations are fluctuations of synoptic scale. Their number isn’t great, therefore as elementary volume it is necessary to consider atmosphere on all hemisphere that doesn’t allow to predict a local climate.

Other way of definition of average values – smoothing of fields. However to solve a problem of smoothing by means of known formal methods of a filtration (for example, stated in [4]), it is impossible, since preconditions of formal methods don’t correspond to properties of real atmospheric processes. Consideration of these preconditions is beyond the present article, therefore we will be limited to the remark that if they didn’t contradict real processes the filtration problem has been already solved.

Let’s consider a method of a filtration of fields from synergetics positions in terms of the theory of casual processes. The basic concept of this theory is the concept about realization of casual process. Realizations, as it is known, are usual functions. Process name casual only because it is in advance impossible to specify, what will be following realization from set of potentially possible realizations.

Definition of casual process will well be coordinated with concepts of synergetics, in particular, with concept of dynamic chaos [9]. In the beginning we will consider, in what this conformity on an example фрактальной Kokh’s curve [9] consists. It is possible to present each level of a fractal as set of кусочно-линейных functions

\[
y_j(t) = a_j(t) + b_j x_j(t),
\]

\[
x_j(t) = f(t),
\]

where \( x, y \) – horizontal coordinates; \( k \) – number of level of a fractal; \( j \) – conditional number of an element of a fractal at the given level, \( t \) – time. Set of parameters of a «correct» curve of Kokh is usual discrete function. However it is possible will present Kokh’s constructed by means of casual une-
qualateral triangles «the wrong» function. Then we will receive family of linear functions with casual parameters \( c_0, d_j \), which with good reason can be considered as casual process. For preservation of linear dependence \( y \) from \( x \) function \( f(t) \) shouldn’t depend from \( k, j \). Substituting (2) in (1) and summarizing for each \( k \) levels on realizations \( j \) at everyone \( t \), we will receive

\[
y_k(t) = \alpha_y(t) + \beta_y(t) \bar{y}_k(t),
\]

where \( \bar{y}_k(t) \) – a population mean of casual process.

Thus, in fractal form it is possible to express homogeneous non-stationary casual process to environment through its population mean if set of physically homogeneous realizations is correctly defined.

It is possible to consider atmosphere as fractal form environment. The climate is level of a fractal of higher order, in comparison with final conditions. Changes of this ensemble (climate of inwardnesses of atmosphere under constant external conditions) we will receive

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the general structure, without destroying thus all structure. From this it follows that for the climate description it is necessary to find empirically inter-relation for the greatest possible number of levels of a fractal (this purpose has been formulated still in 1980 [10]). As a matter of fact, it leads to a restoration problem of аттраектора on time numbers of supervision. The decision of this problem name also system synthesis [2]. In [7] main principles of system synthesis on an example of modeling of a climate are stated.

Summing up, we can conclude that the method of synthesis system developed thermodynamic approach to equilibrium and no equilibrium processes. Invariants in (7), (11) implicitly characterize the direction and magnitude of flows generated by the potential fields. Parameters of equations (5), (6) are relative indicators of fluxes in the atmosphere – thermodynamic characteristics. When flows of climate fluctuations remains constant, and only their scalar, and with climate change – and change the direction of flows and their inner characteristics.

We examined two related fluctuations of the atmosphere. Full empirical model can contain 40-50 of equations (80-100 empirical parameters). It is incomparably smaller than the hydrodynamic theory of climate change. Therefore, technology forecasting climate can be developed in the near future. The main problem is getting to an array of qualitative data for the hemisphere in increments not exceeding 12 hours.

References