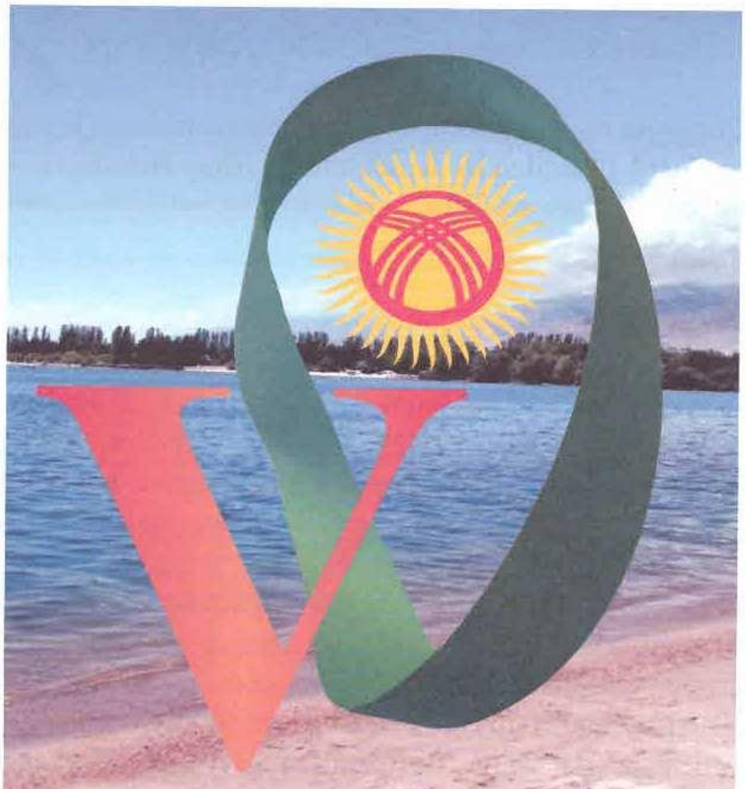
V CONGRESS OF THE
TURKIC WORLD MATHEMATICIANS

Kyrgyzstan, Issyk-Kul, 5-7 June, 2014



# ABSTRACTS

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## SECTION 7. OPTIMIZATION AND CONTROL THEORY

# STUDY OF THE DEVELOPMENT OF THE ATMOSPHERIC PROCESSES OF THE INDUSTRIAL CITY, TAKING INTO ACCOUNT PHOTOCHEMICAL TRANSFORMATIONS

Almas Temirbekov
Ust-Kamenogorsk (Kazakhstan)
almas_tem@mail.ru

To study the influence of anthropogenic heat sources, pollutants and heterogeneity of the underlying surface to the atmosphere of an industrial city in the three-dimensional region a model of the atmospheric boundary layer of the following form [1, 2, 3] is considered.

equations of motion:

$$\frac{\partial u}{\partial t}+\frac{\partial u^2}{\partial x}+\frac{\partial uv}{\partial y}+\frac{\partial u\omega}{\partial z}=-\frac{\partial \pi}{\partial x}+lv+\frac{\partial}{\partial z}(\nu\frac{\partial u}{\partial z})+\triangle u, \quad (1)$$

$$\frac{\partial v}{\partial t}+\frac{\partial uv}{\partial x}+\frac{\partial v^2}{\partial y}+\frac{\partial u\omega}{\partial z}=-\frac{\partial \pi}{\partial y}-lu+\frac{\partial}{\partial z}(\nu\frac{\partial v}{\partial z})+\triangle v, \quad (2)$$

$$\frac{\partial \omega}{\partial t}+\frac{\partial u\omega}{\partial x}+\frac{\partial v\omega}{\partial y}+\frac{\partial \omega^2}{\partial z}=-\frac{\partial \pi}{\partial y}+\lambda\theta+\frac{\partial}{\partial z}(\nu\frac{\partial \omega}{\partial z})+\triangle \omega, \quad (3)$$

continuity equation under the assumption that the spatial and temporal changes of density are insignificant:

$$div\vec{U}=\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial \omega}{\partial z}=0, \quad (4)$$

equation of heat flow:

$$\frac{\partial \theta}{\partial t}+\frac{\partial u\theta}{\partial x}+\frac{\partial v\theta}{\partial y}+\frac{\partial \omega\theta}{\partial z}+u(S\frac{\partial \delta}{\partial x}+\theta_x)+v(S\frac{\partial \delta}{\partial y}+\theta_y)=\frac{\partial}{\partial z}(\nu\frac{\partial \theta}{\partial z})+\triangle\theta, \quad (5)$$

In order to consider the transformations of harmful impurities at transferring the technique proposed in [4] is used. To simulate photochemical processes fifteen most common types of harmful substances such as $CH_2O$, $CO$, $CO_2$, $SO_2$, $SO_3$, $HSO_3$, $NO$, $NO_2$, $NO_3$, $HNO_3$, $MgO$, $CaO$, $H_2SO_4$, $MgSO_4$, $CaSO_4$ and chemical reactions between them has been chosen.

transport equation and photochemical transformation of pollutants:

$$\frac{\partial \varphi_q}{\partial t}+\frac{\partial u\varphi_q}{\partial x}+\frac{\partial v\varphi_q}{\partial y}+\frac{\partial \omega\varphi_q}{\partial z}=\Delta\varphi_q+\frac{\partial}{\partial z}(\nu\frac{\partial \varphi_q}{\partial z})+\alpha_q\varphi_q+\beta_q+f_q, \quad (6)$$

$$\sum_q \varphi_q=1.$$

## References

[1] Marchuk G.I. Mathematical Modeling in the Environment Problem. Moscow.:Nauka, 1982. 320 p.

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[3] Peneko V.V., Aloyan A.E. Models and Methods for the Problems of Environment Protection. Novosibirsk: Nauka, 1985. p.255.

[4] Arguchintsev V.K., Arguchintseva A.V. Modeling of mesogrid hydra-thermodynamic processes and transfer of anthropogenic impurities in the atmosphere and hydrosphere of Lake Baikal region. Irkutsk : Edition of Irkutsk State University, 2007, p. 255.