On the PBL – turbulent regime effects over atmosphere–land, sea interaction processes

E. Syrakov

University of Sofia, Faculty of Physics, Department of Meteorology and Geophysics,Bulgaria. (esyrakov@phys.uni-sofia.bg / Fax: 359 (2) 962 5276 / Phone: +359 (2) 8161 315)

It is considered a wide range of PBL – turbulent regimes, characterized by the following input external (aerologic – synoptic) parameters (extended with Zilitinkevich stable long – lived regimes):

(1) R_0, R_{0I}, S,Λ_x, Λ_y; φ, ψ, X_a, Y_a, H_a; μ_N, μ_{cap},

where $R_0 = G_0/fz_0$and $R_{0I} = G_0/fh$ are geostrophic and inversion Rosby number, h – inversion height, $S = \beta\left(\theta_h - \theta_0\right)/fG_0$ – stratification parameter, $\Lambda_x \quad \Lambda_y$ and φ, ψ are baroclinic and terrain slope parameters, X_E, Y_E, H_E are entrainment flux parameters, μ_N and μ_{cap} are corresponding non-local (Zilitinkevich and Calanca, 2000) and capping inversion (Syrakov, Syrakov and Cholakov 2005) parameters. On the basis of the determined explicit dependence of the universal$A$, B, C functions on the internal, corresponding to (1) parameters (Syrakov 1990, 2004,2005), it is solved PBL resistance and heat transfer laws and it is determined basic flux–interaction characteristics: drag coefficient C_d, Stenton heat number C_H, the full angle $\alpha$of turning of the wind in PBL and etc. from parameters (1) over land (z_0 ∼const) and sea (z_0 with accounting Charnock's (gravity waves) and molecular viscosity effects) at diagnostic or evolution ($\theta_0 = \theta_0\left(t\right)$,$h = h\left(t\right)$ – formula of type Smeda – Deardorf) regimes. Part of the results are validated with Wangara data and data over sea (without sea storm regimes), it is also studied the behavior of neutral and stable long-lived PBL (influence of the parameters μ_N andμ_{cap}) and etc. Because of the great number complex combined regimes based on (1), it is coming more detailed analyze on it, which will be subject of following works.

The developed PBL – parameterization can be used in numerical weather and climate models, as well as in diffusion problems at different scales.

Reference:

Syrakov E., 1990, Dr. of Sci. Thesis, Uni. Sofia, p. 274. Syrakov E., 2004, Fourth ann. Meeting on the Ems, Ann. Meet. Abst., vol. 1,EMS–A–00371, Nice, France, 26–30 Sept. Syrakov E. and E. Cholakov, 2005, Proc. Of the Third Int. Symp. AQM, vol. II, 1453–1465, Istanbul, Turkey, 26–30 Sept. Syrakov E., 2005. Ann. De L'Uni de Sofia Fac. De Phys. Vol 98, 167–184. Zilitinkevich S. and P. Calanca, 2000, Quart. J. Roy. Meteorol. Soc., 126, 1913–1923