Eighth Workshop Dynamical Systems Applied
to Biology and Natural Sciences DSABNS 2017
Évora, Portugal, January 31st - February 3rd, 2017

WEATHER FOREAST AS A QUANTITATIVE PREDICTOR FOR COMMON COLD

Eugene B. Postnikov

Department of Theoretical Physics, Kursk State University,
Radishcheva st. 33, Kursk 305000, Russia

postnicov@gmail.com

It is shown [1, 2] that the flu activity in the regions of moderate climate can be effectively estimated using the SIRS model with variable parameter $k(T)$ (the factor multiplied by the IS term). In this particular case, this $k = k_0 \left[1 + \kappa \left(T(t - \Delta)\right)\right]$ actually consist of two terms, where k_0 is the conventional contact rate (constant or very slow varying), and the fast varying $\kappa \left(T(t - \Delta)\right)$ acts as a measure for the instant (with some time lag) immunity loss due to organism's overcooling. This interpretation is based on the form linearised around a steady state (I_s, S_s) of infected and susceptible persons:$d_t i = k_0 I_s \left(s + \kappa(T(t))S_s\right)$, which also provides an opportunity to obtain an explicit expression for the variable epidemic level (with the time resolution around some days) calculated as $i \sim \int_\Delta^t \kappa(t' - \Delta)G(t - t')dt'$, $G(\xi) = \frac{1}{\omega} e^{-\frac{\lambda}{2}\xi} \left[\left(\theta^{-1} - \frac{\lambda}{2}\right) \sin(\omega\xi) + \omega \cos(\omega\xi)\right]$, where the Green function expressed through the SIRS's parameters is used.

The model is tested using data on influenza-like diseases (ILI) available from `Influenzanet` and `European Climate Assessment & Dataset` for the Netherlands during 2009-2015. Its argued that the considered model is restricted to the case of common cold but not of influenza in a strict sense. The microbiological and physiological background for this will be discussed.

References

[1] Postnikov E.B., Tatarenkov D.V. (2013). *Prediction of flu epidemic activity with dynamical model based on weather forecast* Ecol. Complexity, **15**, 109-113.

[2] Postnikov E.B. (2016). *Dynamical prediction of flu seasonality driven by ambient temperature: influenza vs. common cold*, Eur. Phys. J. B, **89**:13.

 ISBN: 978-989-98750-3-6