

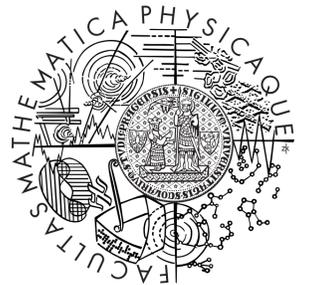


NÁZEV PŘÍSPĚVKU

LUBOŠ PRCHAL

prchal@karlin.mff.cuni.cz

Department of Statistics, Charles University, Prague

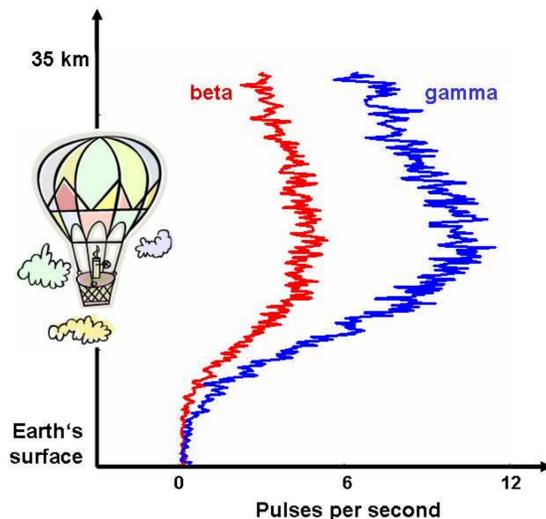


SUMMARY

The poster presents a statistical analysis of the dependence of atmospheric radioactivity on the altitude. As a theoretical model explaining the physical background of this process is not known ...

METEOROLOGICAL EXPERIMENT

Analyzed data come from Prague-Libuš upper air meteorological station of the Czech Hydrometeorological Institute, where every month the vertical profiles of beta and gamma radioactivity are measured by the radioactivity sonde system. The radioactivity sensor consisting of two Geiger-Müller gamma and beta tubes is a part of meteorological balloons which ascends from the earth's surface up to 35 km and detects short current pulses coming from the interaction between the radiation and the tube wall material.



APPLIED REGRESSION MODELS

The first aim of the analysis was to ...

$$m_1(x) = r(x) + ex + k;$$

$$m_2(x) = r(x) + e \left(1 + \exp\{-f(x - g)\} \right) + k.$$

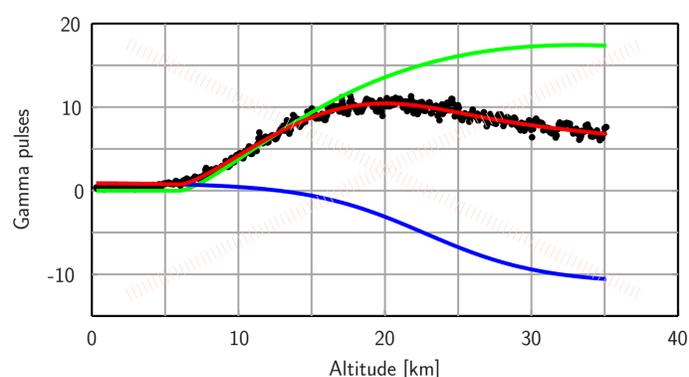
COMPUTATIONAL CHALLENGES

We used the classical Least Squares method to estimate the unknown parameters of suggested models $m_1(x)$ and $m_2(x)$. Although ...

Choice of software

.....

Mathematica 5 offers, as default, one extremely rapid function (FindFit). However, it sometimes results into **non-sense and uninterpretable parameterizations** as shown in the figure.



ANALYSIS OF VARIABILITY

Radioactivity measurements evidently show heteroscedasticity. The goal was to suggest a suitable parametric model, estimate its parameters and study its properties.

...

Change point detection

A natural question appears: **series Is the variance constant or not?** More precisely, the question is how to perform a statistical test of the **hypothesis of a constant variance** against ...

1 TRANSFORMATION

Assuming independent and normal U_i we get

$$W_j = \frac{\sigma_{2j-1}^2 U_{2j-1}^2 + U_{2j}^2}{2 \sigma_{2j}^2} \sim \text{Exp}(\sigma_{2j-1}^2)$$

2 MOMENTS OF T

To calculate moments of T denote

$$Z_j = W_j \left(\sum_{k=1}^{n/2} W_k \right)^{-1}.$$

Estimators

...

FUTURE PLANS

The presented work should be understood as the first step in analyzing atmospheric radiation. However, a lot of interesting statistical and meteorological questions still remain without satisfactory answers. Among them, we would like to focus mainly on the following:

Acknowledgement. Author would like to express his thanks to Prof. Jaromír Antoch for his generous support, valuable comments and help. The poster was supported by grants GAČR 201/03/0945 and MSM 113200008.

References.

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