



RISK ASSESSMENT OF VEER OFF DURING LANDING

Assessment of risk factors and precursors for veer off events

The degree of influence of the considered parameters on landing run metrics may be evaluated by regression methods. The influence of categorical parameters at the metrics value was assessed by using Mann-Whitney test, and the influence of continuous parameters — by Spearman's correlation coefficient.

There are revealed:

- an increase of TI_z metrics value on a snow-covered runway (compared with dry and purified one);
- an increase of the TI_{nz} and TI_{xr} metrics with an increase in the standard deviations of bank angle or/and yaw angle at the checkpoint on the glide path at a height of 200 feet.

Season influence on the metrics were not found (even in Russian climate).

The results obtained do not contradict data base of observations.

Abnormal landings identification as a way to prevent aircraft veer off events

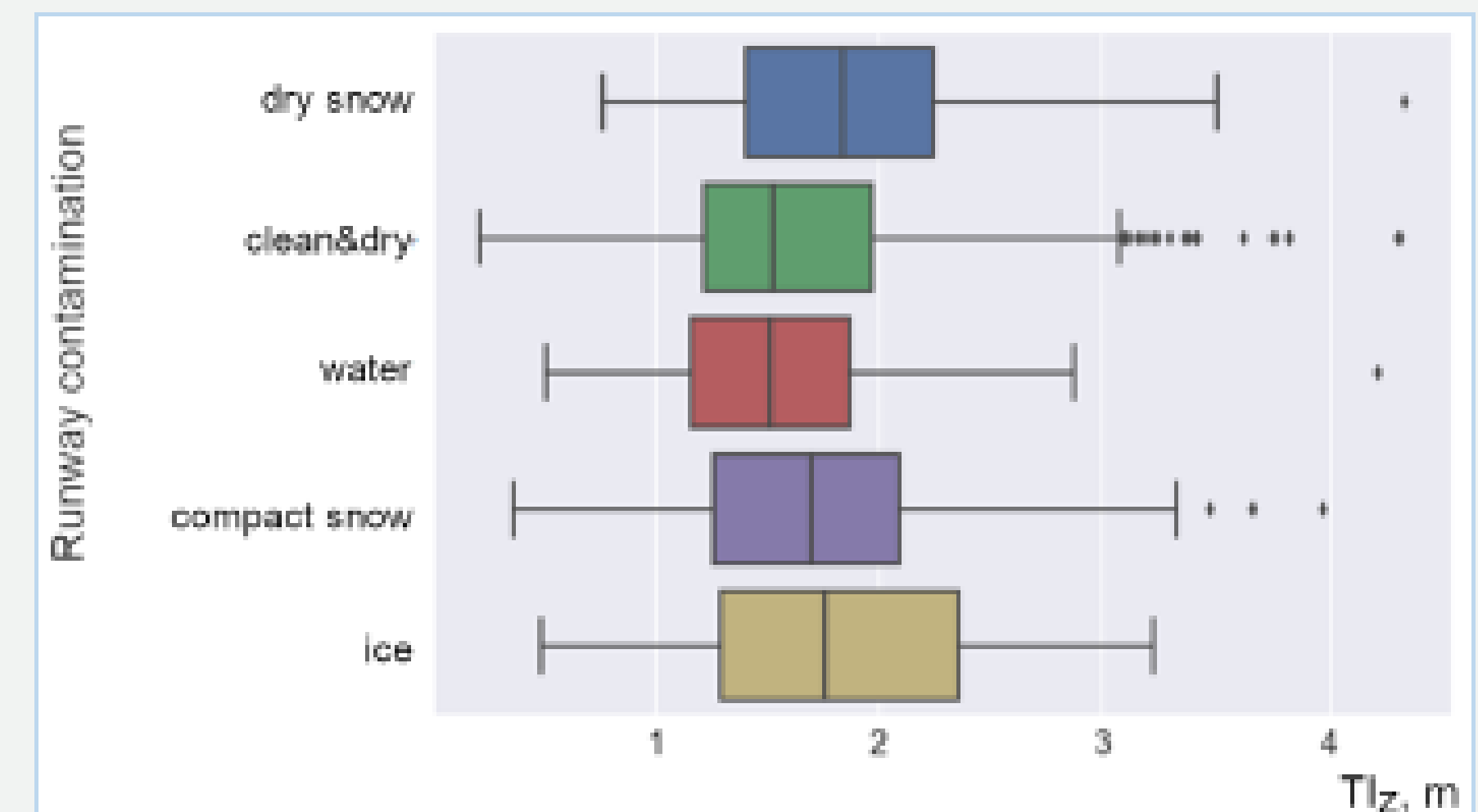
If to assume for considered set of landings, that in each current vertical plane perpendicular to RWY axis flight parameters are distributed according to normal law, it is proposed the following algorithm of current situation assessment:

- if the flight parameters belong to multidimensional “tube” of σ width, then the approach may be considered as normal (safe);
- if one of the flight parameters is outside a “tube” of 2σ width, then the approach is considered as “abnormal”.

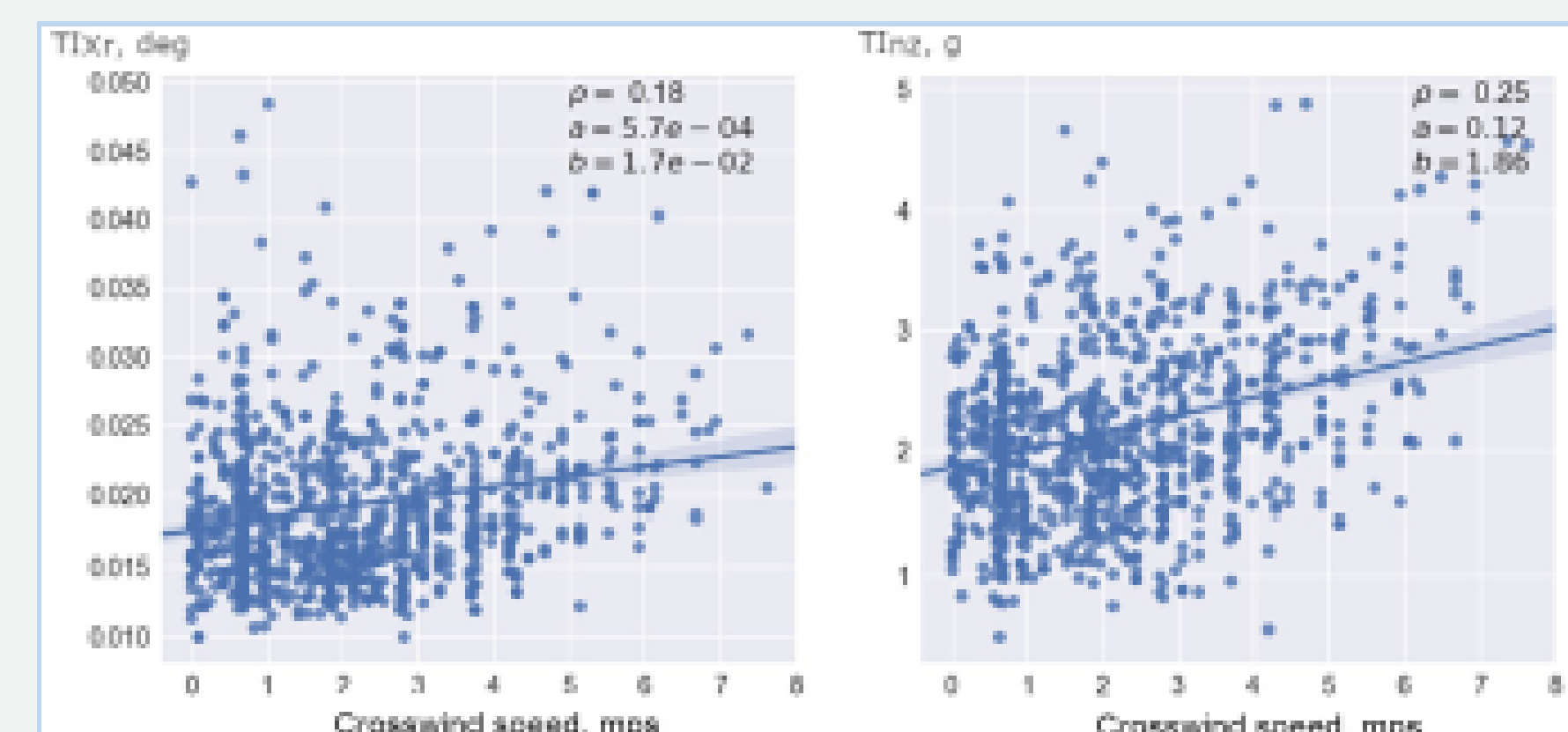
Various machine learning methods may be used to build a multi-dimensional model describing distribution of flight parameters and landing conditions (meteorological and RWY surface conditions) and to detect abnormal landing approaches.

There was used in TsAGI (in particular) the method of describing the multidimensional envelope of flight parameters variations with a mixture of Gaussian distributions (Gaussian Mixture Model - GMM).

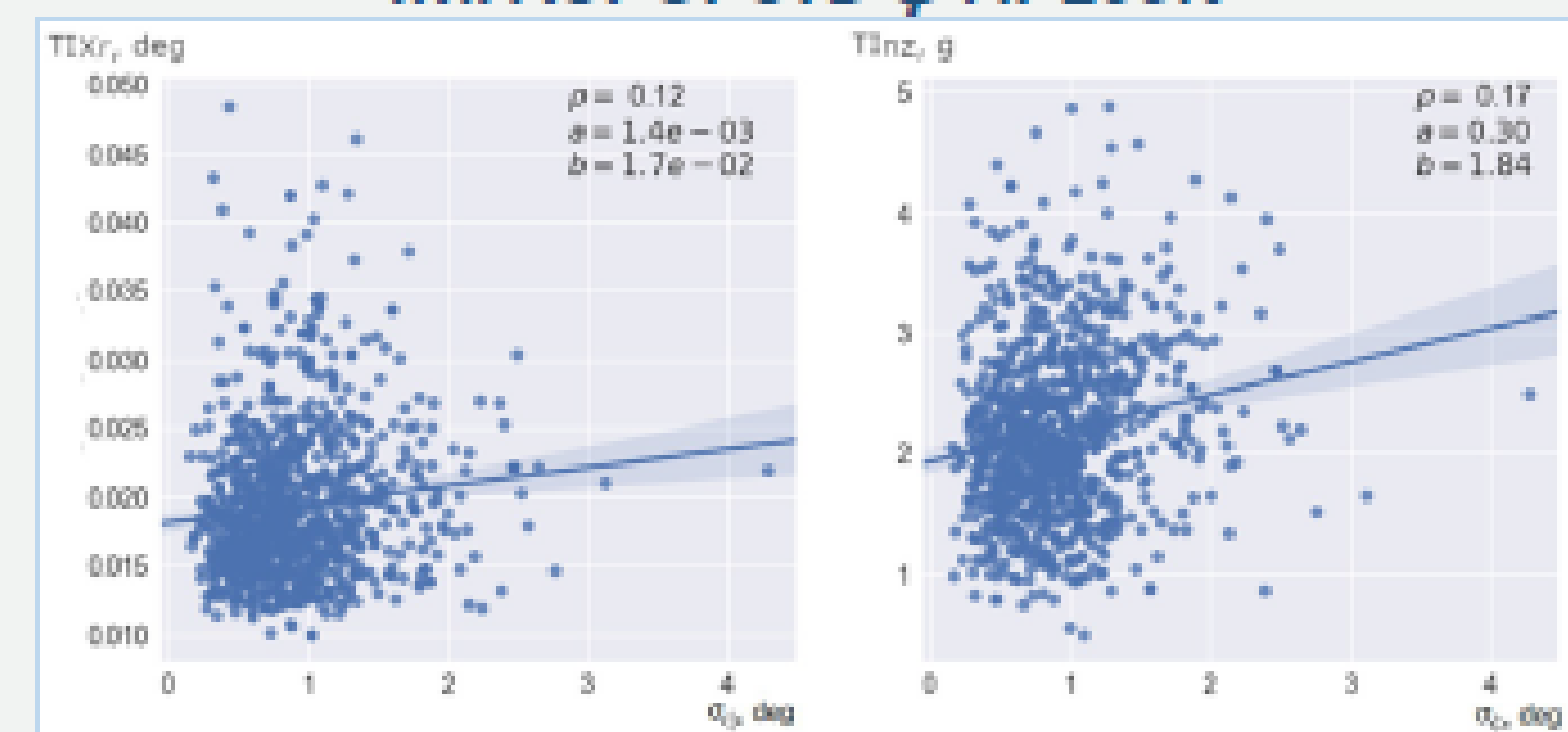
RUNWAY CONTAMINATION IMPACT



CROSSWIND IMPACT



IMPACT OF STD ϕ AT 200ft



“NORMAL” FLIGHTS ENVELOPE

