Retrieval of temperature and pointing information from MIPAS limb emission spectra

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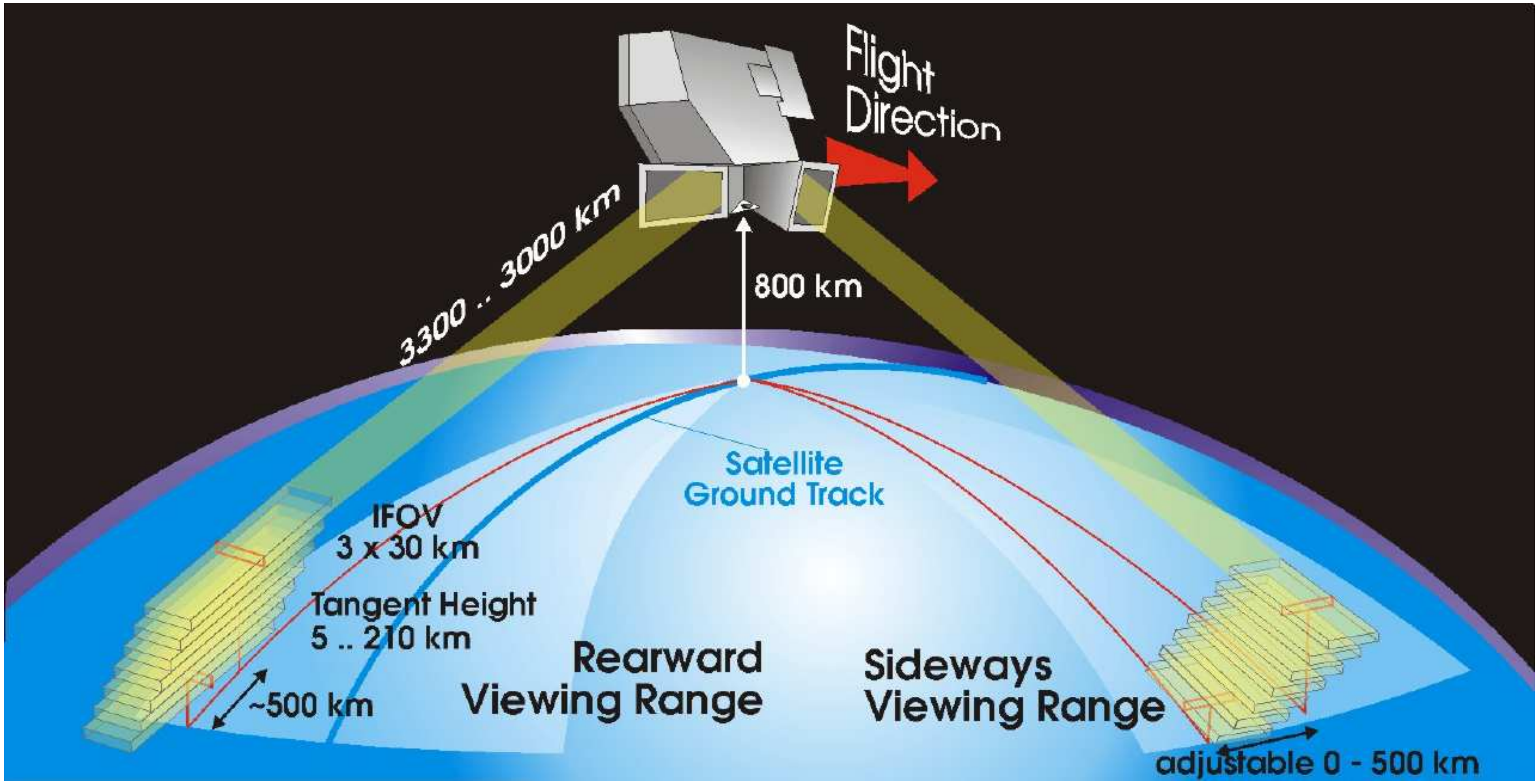
THE ROLE OF TANGENT ALTITUDE IN LIMB SOUNDING



source: M. Endemann, ESA

TANGENT ALTITUDE RETRIEVAL STRATEGY

Unknowns:	VMR of atmospheric constituents; temperature profile; pressure profile; tangent altitudes;
Strategy:	use CO_2-lines (VMR well known) use lines of different temperature dependence; use hydrostatics.

TANGENT ALTITUDE RETRIEVAL, FORMAL APPROACH

$$\mathbf{x}_{i+1} = \mathbf{x}_i + (\mathbf{K}_i^T \mathbf{S}_y^{-1} \mathbf{K}_i + \mathbf{S}_a^{-1})^{-1} (\mathbf{K}_i^T \mathbf{S}_y^{-1} (\mathbf{y}_{meas.} - \mathbf{y}(\mathbf{x}_i)) + \mathbf{S}_a^{-1} (\mathbf{x}_0 - \mathbf{x}_i)).$$

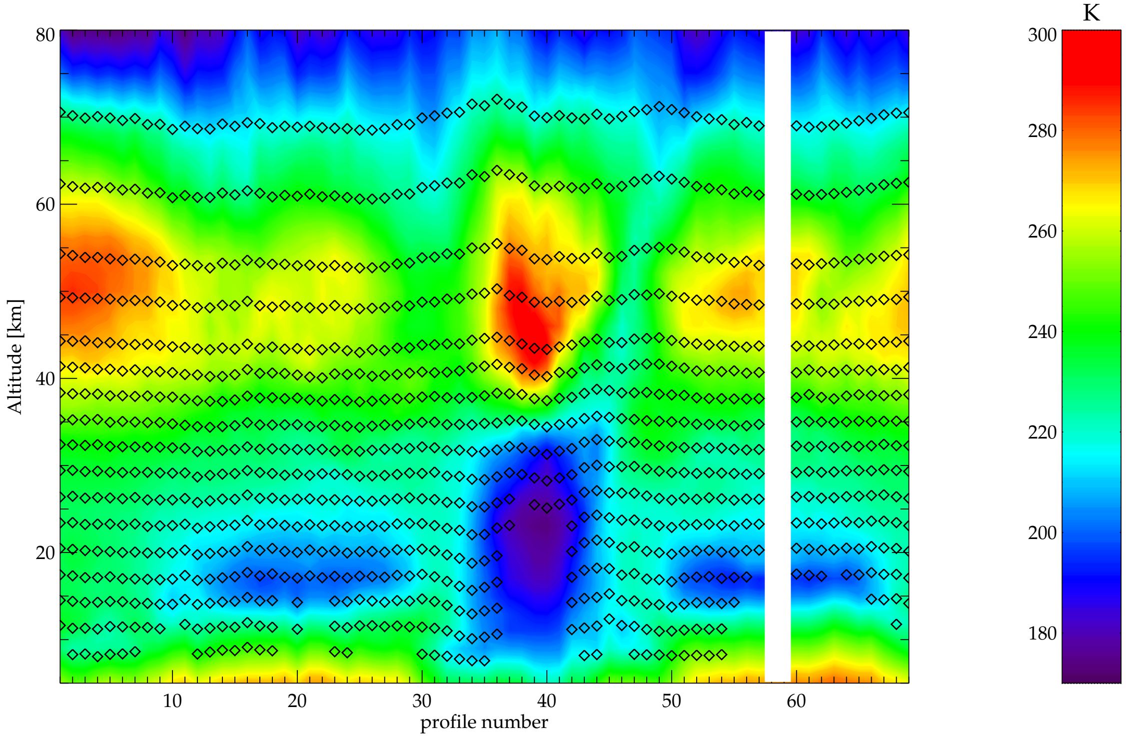
where:

$\mathbf{x}$	vector of unknowns (subscript i denotes iteration)
$\mathbf{y}_{meas.}$	vector of measured spectral radiances
$\mathbf{y}(\mathbf{x}_i)$	vector of modeled radiances
$\mathbf{K}$	Jacobian matrix containing $\partial x_n / \partial y_m$
$\mathbf{S}_y$	covariance matrix of $\mathbf{y}$
$\mathbf{S}_a^{-1}$	constraint

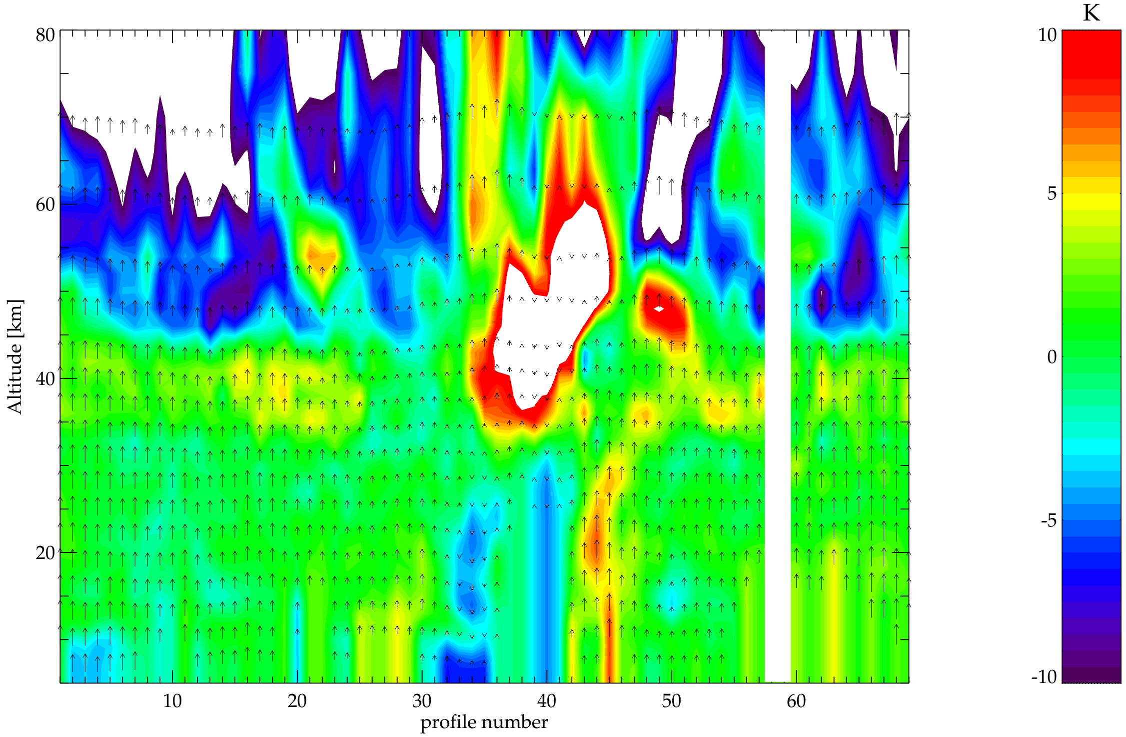
TANGENT ALTITUDE RETRIEVAL, TREATMENT OF UNKNOWNS

temperature profile	retrieved	smoothness constraint
tangent altitudes	retrieved	optional constraint
pressure profile	adjusted	hydrostatics
background continuum	retrieved	smoothness constraint
calibration correction	retrieved	no constraint

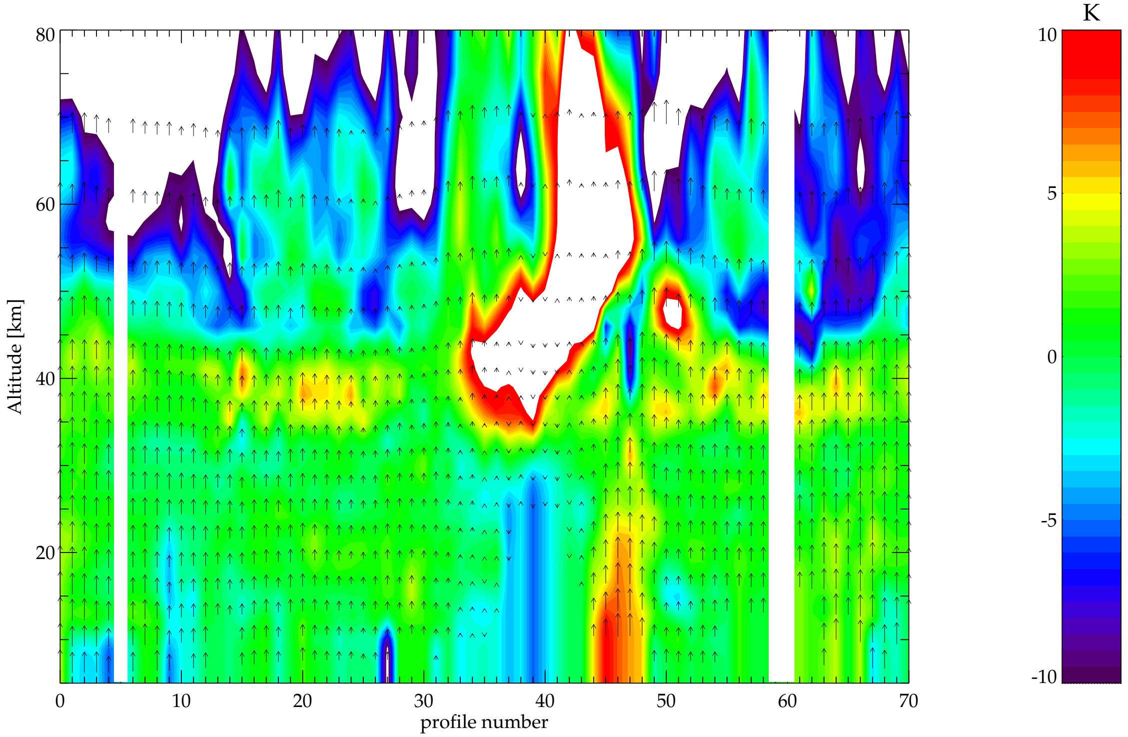
TANGENT ALTITUDE RETRIEVAL



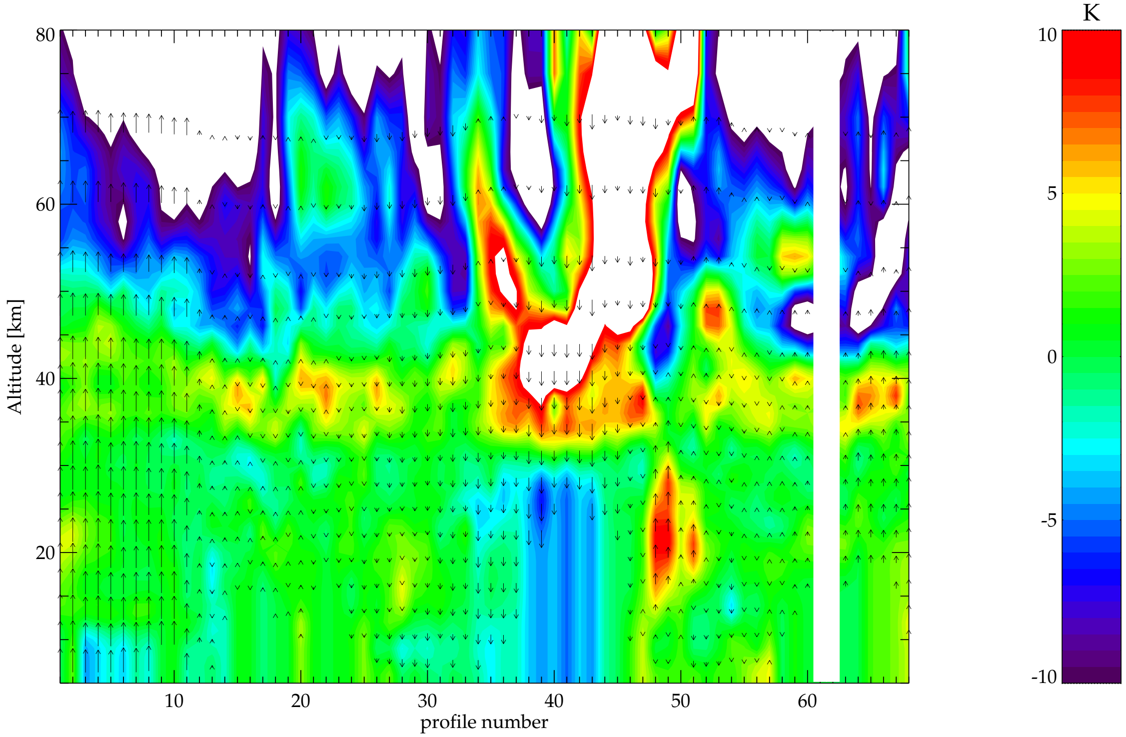
TANGENT ALTITUDE RETRIEVAL



TANGENT ALTITUDE RETRIEVAL



TANGENT ALTITUDE RETRIEVAL



EXPLANATION

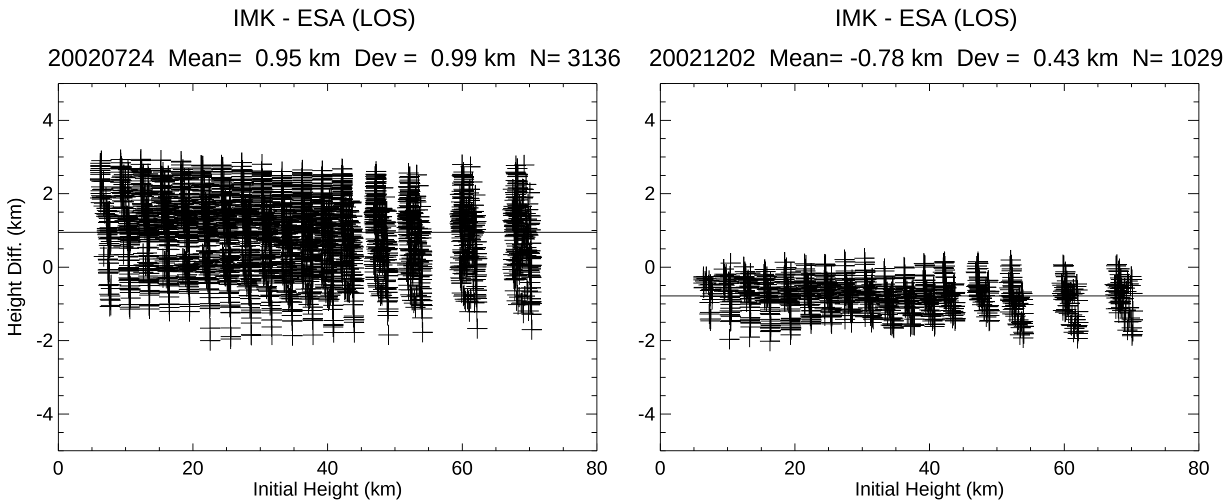
- Tangent altitude offset and oscillation could be attributed to calibration of the MIPAS pointing system.

  Remedy: Recalibration by means of better suited infrared stars seen through the instrument field of view.

- Tangent altitude discontinuities could be attributed to parameter uploads to the Envisat orbit and attitude control system.

  Remedy: More frequent parameter uploads.

CORRECTED POINTING SYSTEM



CONCLUSION

The tangent altitude retrieval scheme developed at IMK proved to be able to detect pointing information deficiencies. It will be used for monitoring of MIPAS pointing information.