Digisonde TID Observations

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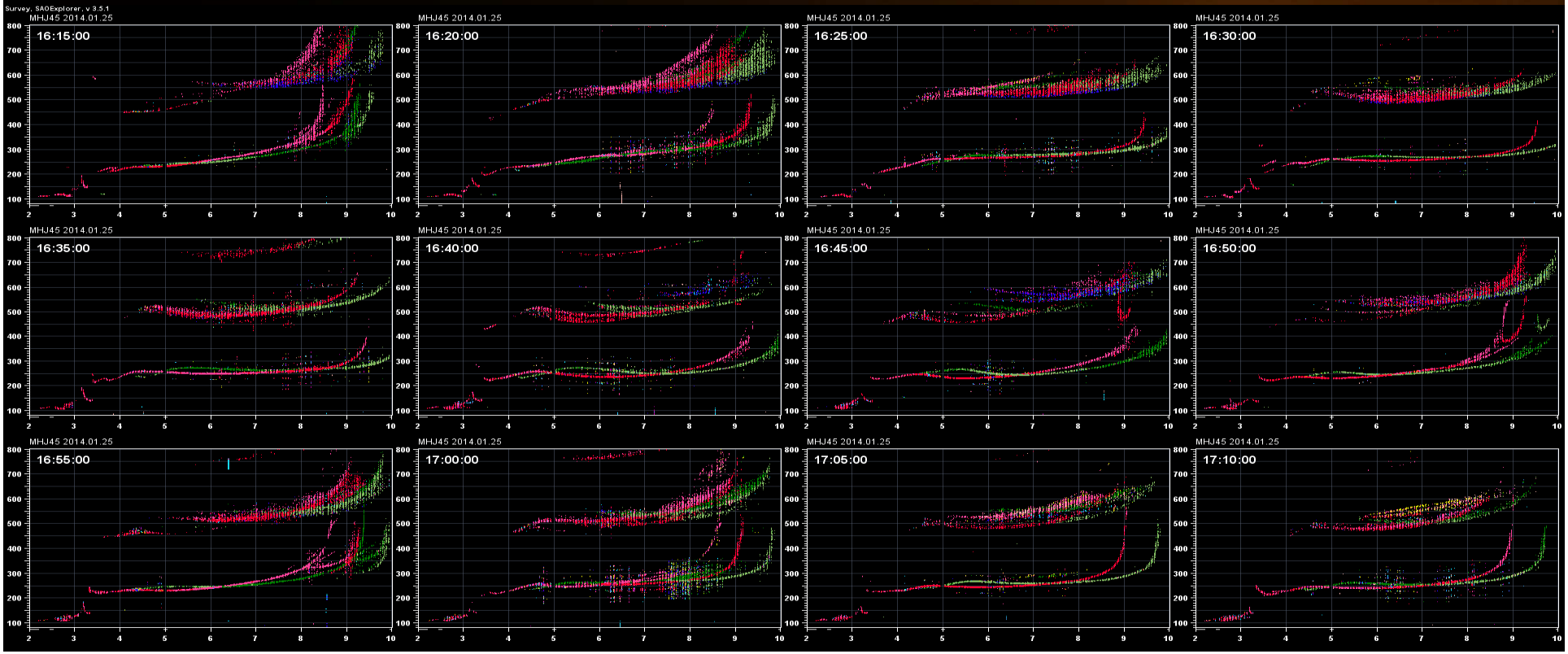
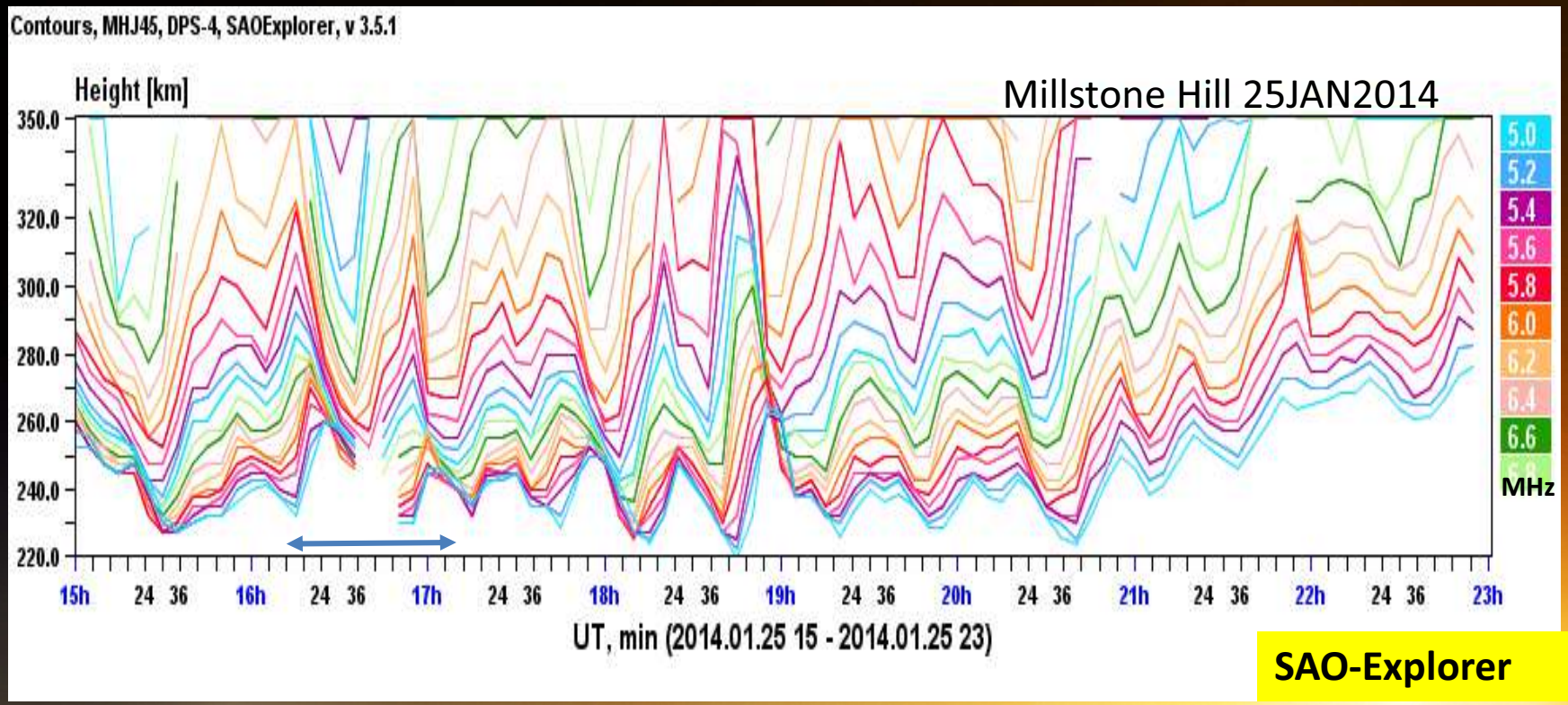
TID Signatures

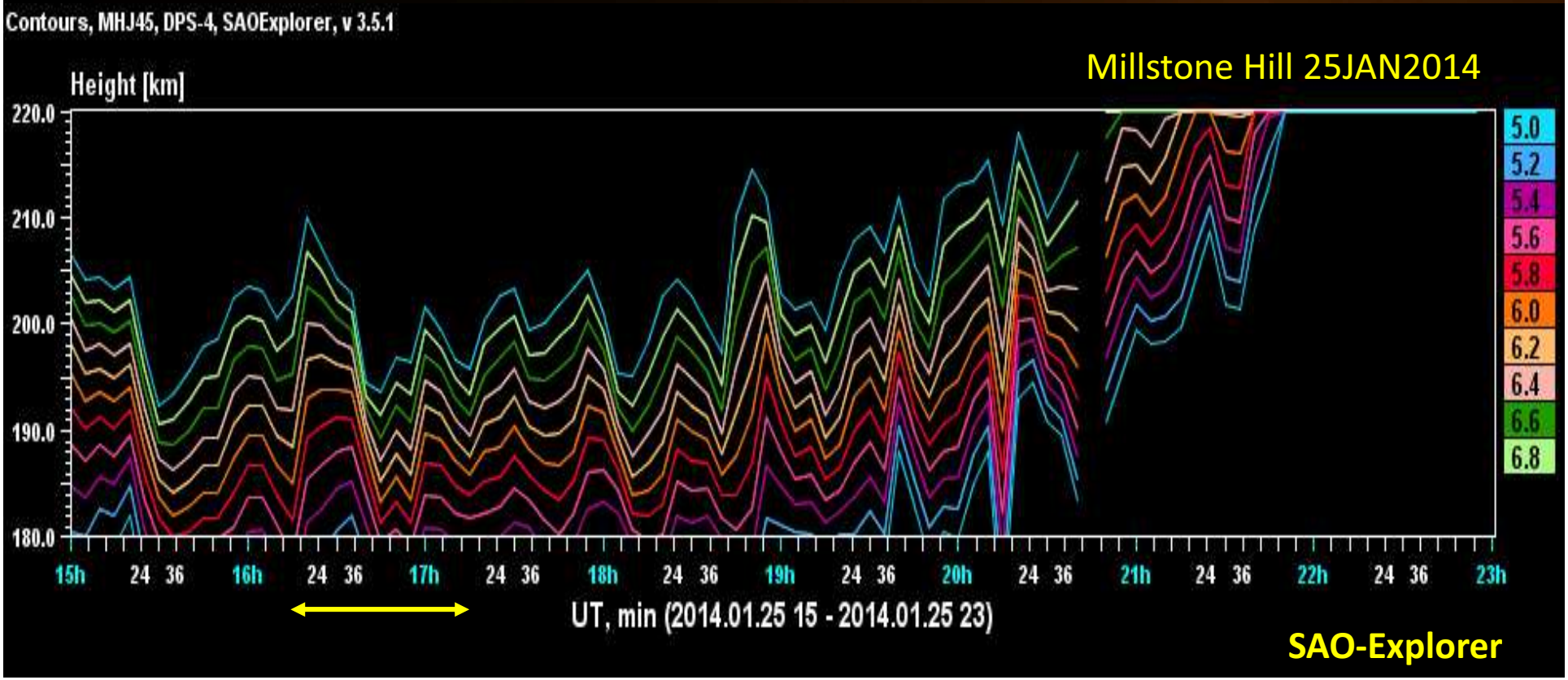
MH 25JAN2014, 1615-1710 UT



Virtual Height Contours vs Time

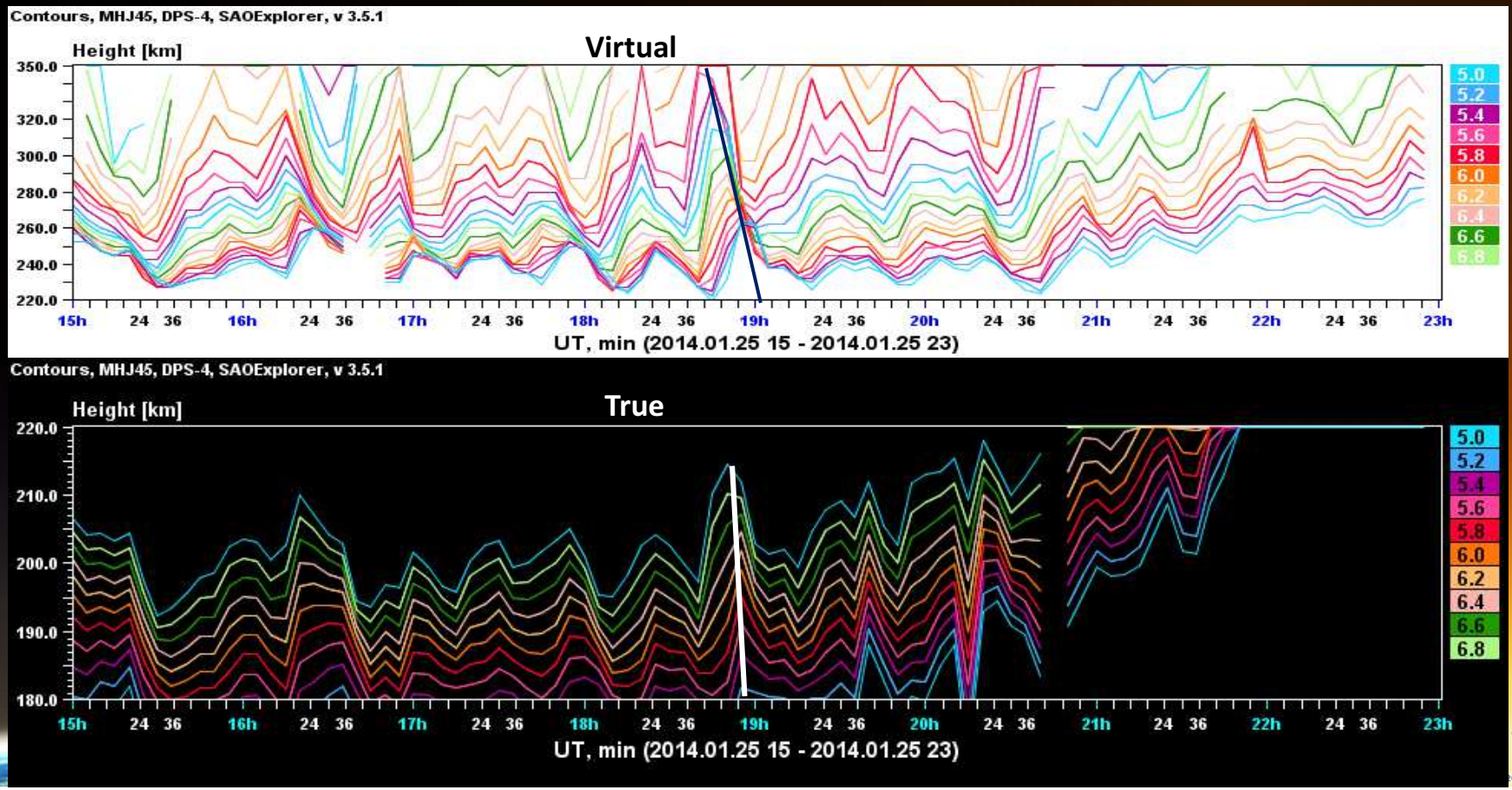


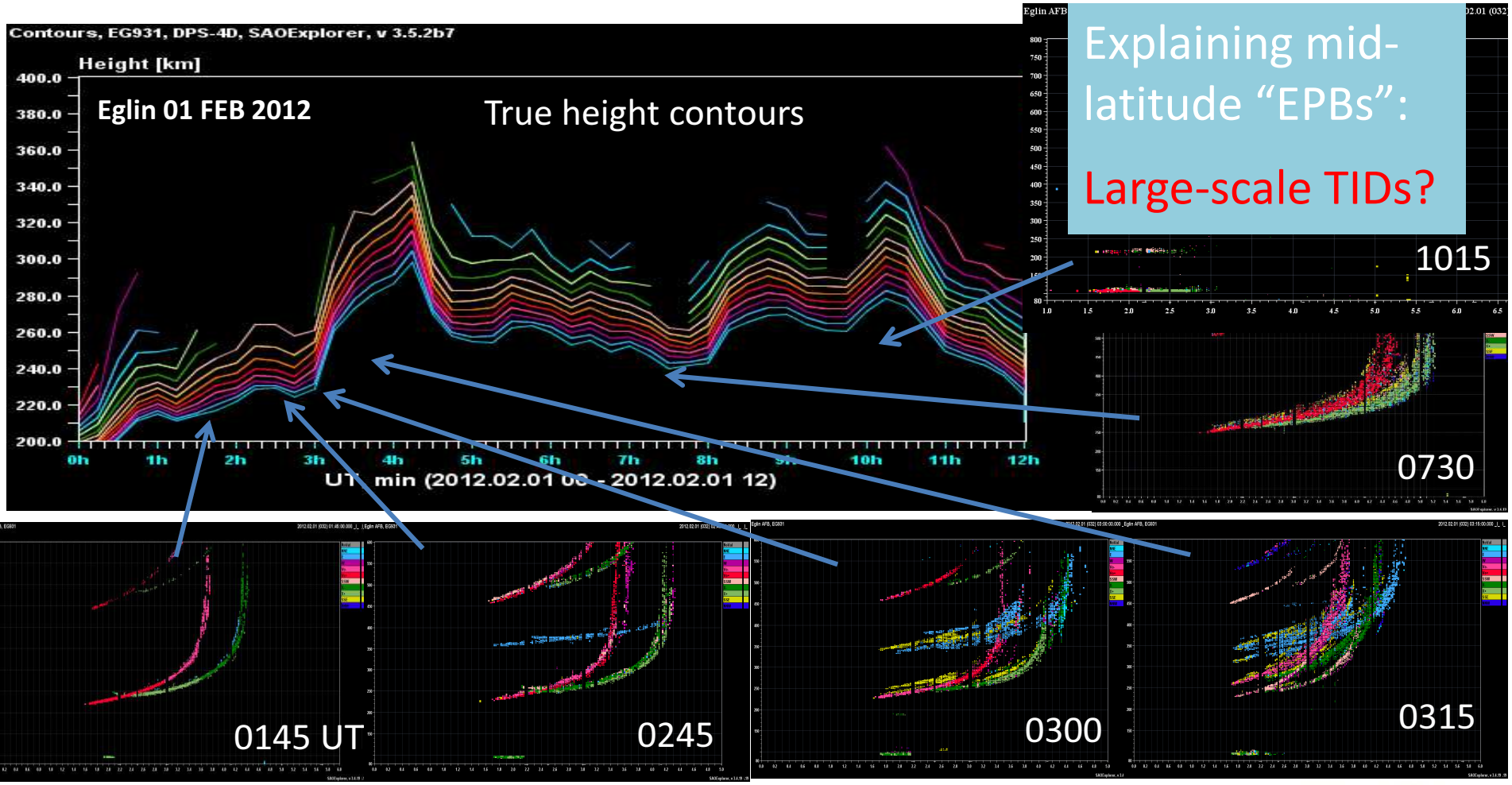
True Height Contours vs Time



Virtual and True Height Contours

Millstone Hill 25JAN2014





Action: Compare neighboring GIRO sites in Europe to see TID propagation?

IGF 2014
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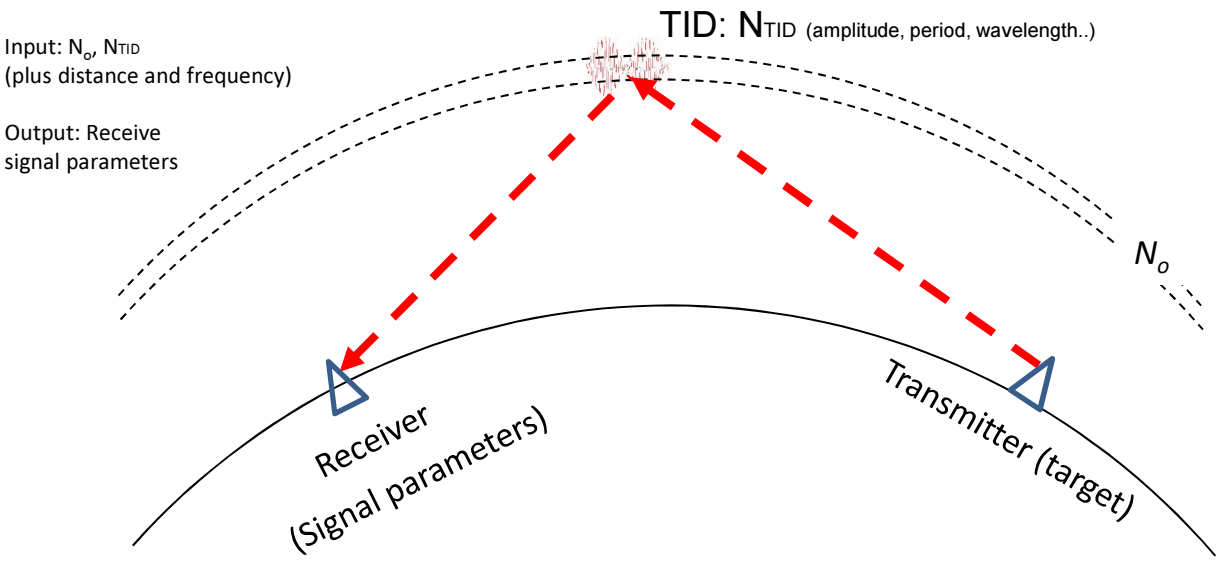
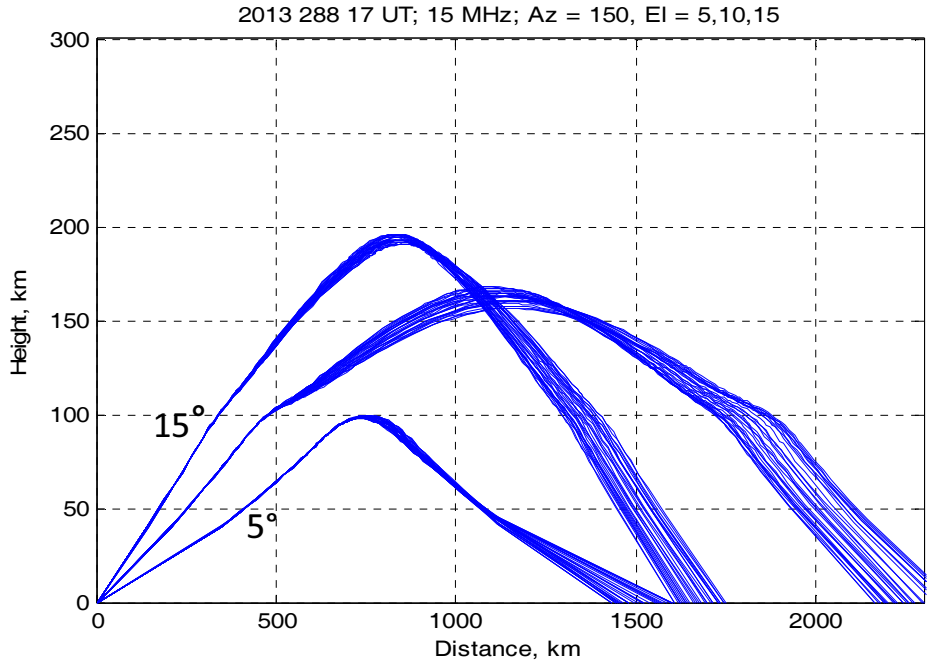
Effects of TID on HFs signal



TID effects on rays with fixed take-off angles

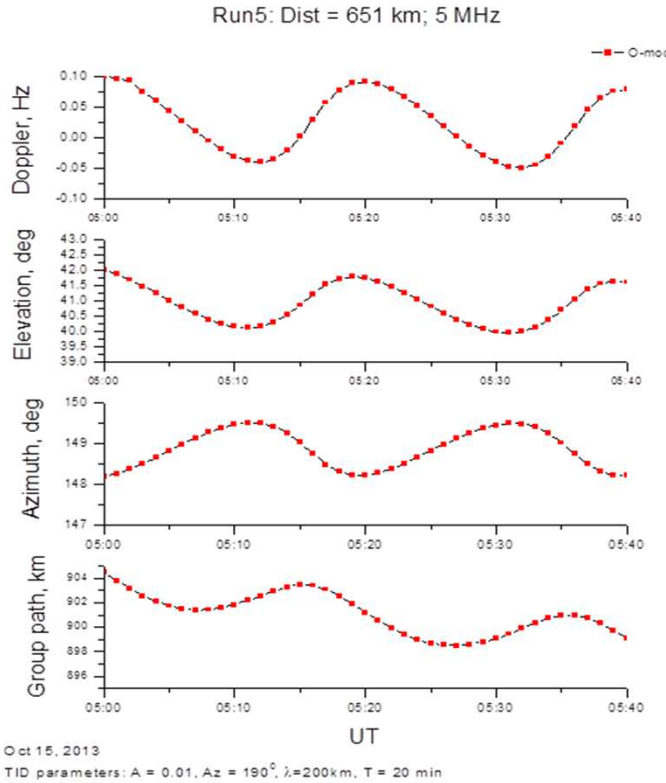
Simulation results



TID effect on long-range propagation at 15 MHz for daytime conditions (foF2=11 MHz). Rays are calculated for elevation angles of 5, 10, and 15° for the duration of one TID period (30 min). TID relative amplitude is 15.6% at 200 km. The TID main effect is the "range spread" of the landing point. Note that at 5° take-off elevation the wave is reflected from the E-layer.

TID Effects on a 5 MHz Signal

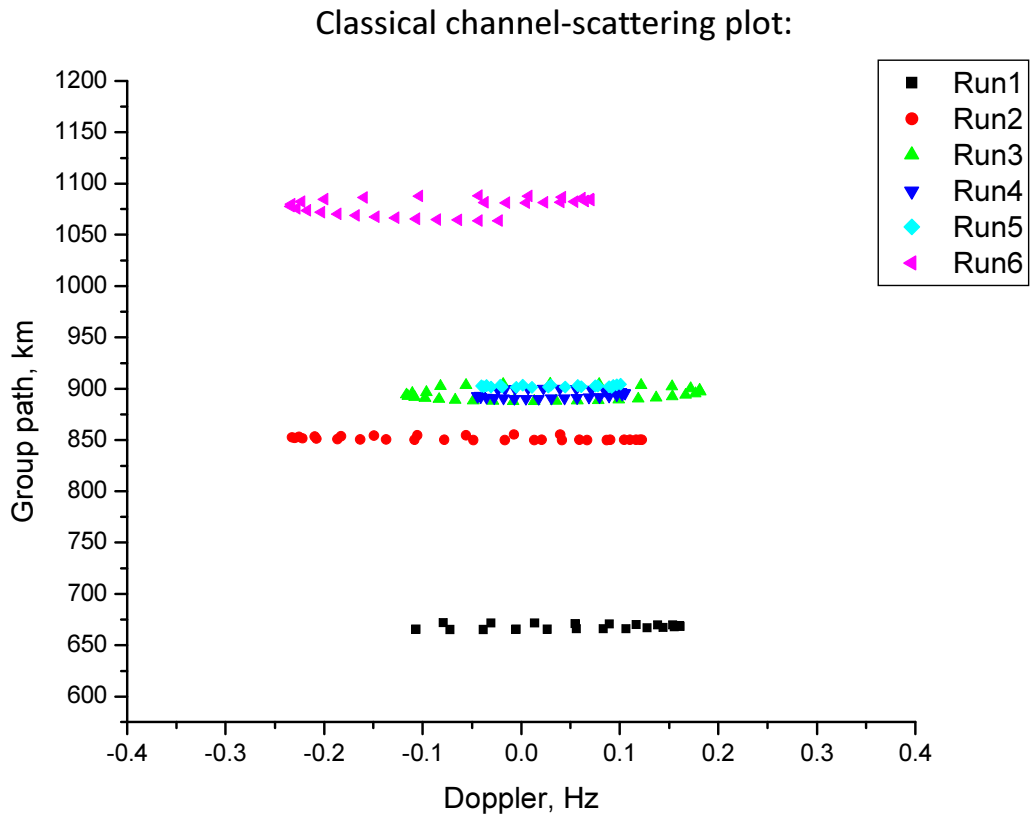
Simulation results for 650 km distance



Typical time variations of signal trajectory parameters produced by the presence of a TID superimposed on the IRI ionosphere. These variations were calculated using the HR2006 raytracing code operated in a homing mode.

Digisonde FAS observations measure these time variations of the trajectory parameters for the reconstruction of the TID wave.

Simulation of HF signal group paths during passage of TID

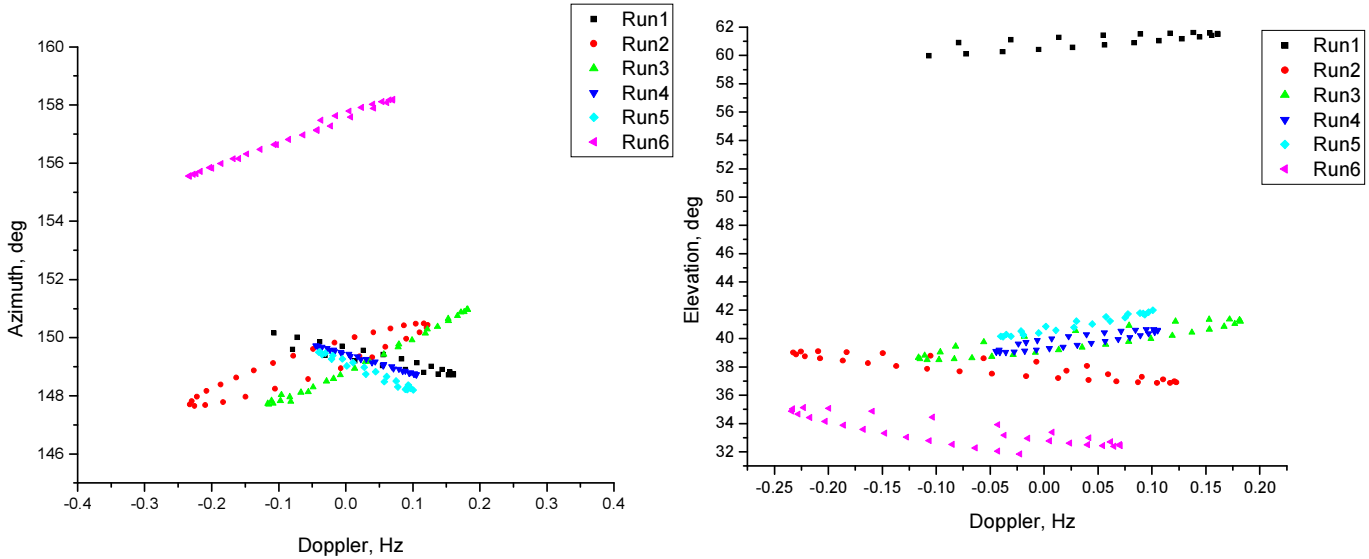


Simulation runs to assess TID effects

	Run1	Run2	Run3	Run4	Run5	Run6
Propagation						
fo, MHz	8.0	8.0	5.0	5.0	5.0	6.0
UT	17:00	17:00	5:00	5:00	5:00	7:00
Distance, km	324	651	651	651	651	853
TID parameters						
Period, min	30	30	30	30	20	30
Wavelength, km	300	300	300	400	200	300
Direction, deg	180	30	90	190	190	30
Amplitude, A	0.01	0.02	0.02	0.01	0.01	0.02

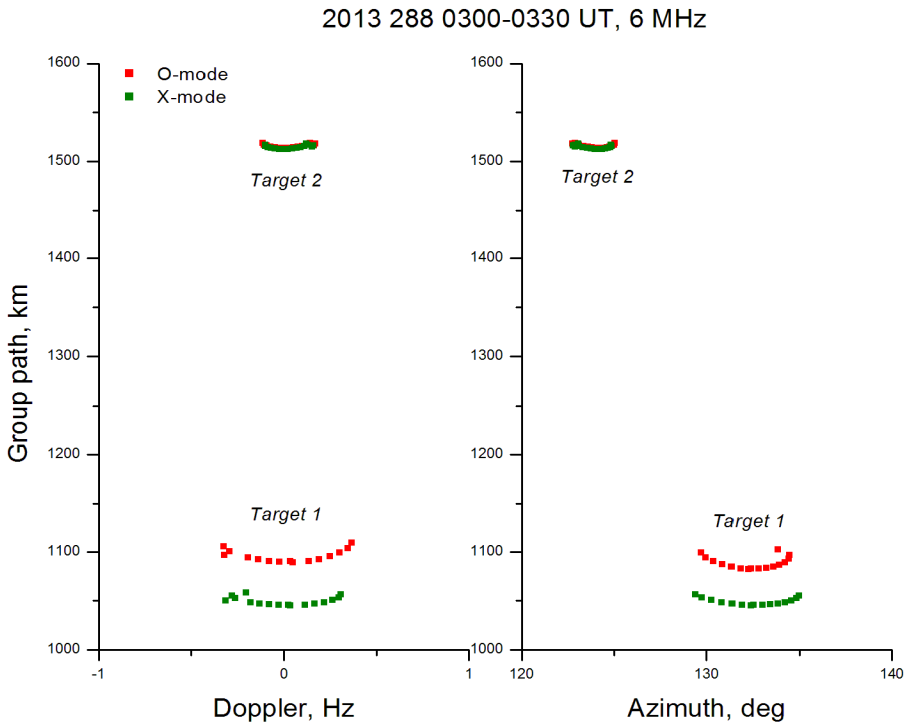
Simulation of HF signal angle-of-arrival during passage of TID

One period of TID is shown



Trajectory parameter plots similar to the channel scatter plot. The simulated signal parameters dramatically depend on the TID parameters and exhibit large variations in Doppler frequencies and arrival angles. Parameters for each simulation run are given in Table 1.

Channel scattering plot



Simulated channel scatter plots showing the Doppler and azimuth variations during a 30 min observation period. The assumed TID has an amplitude of 13.6% and a period of 30 min.