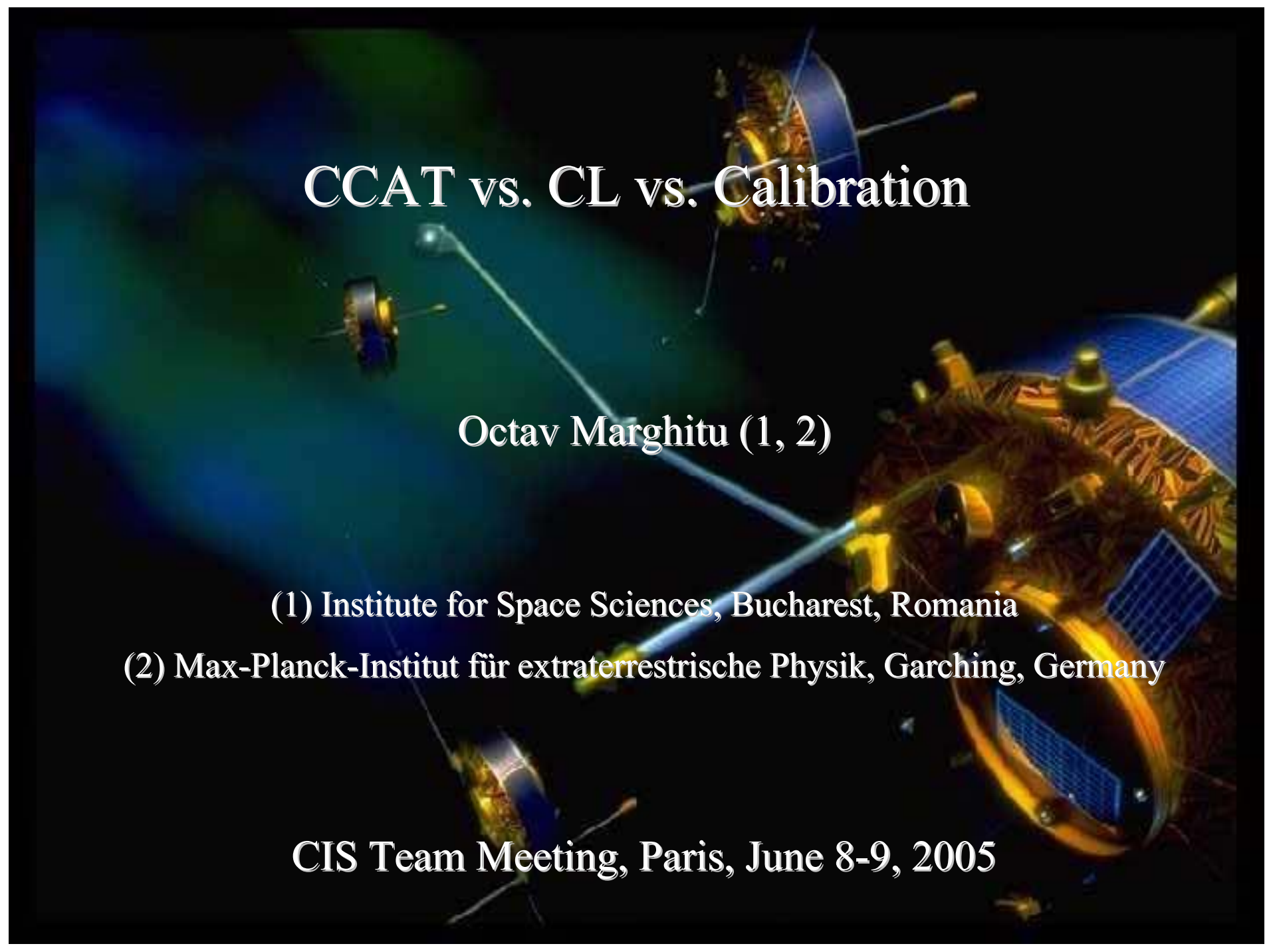

CCAT vs. CL vs. Calibration

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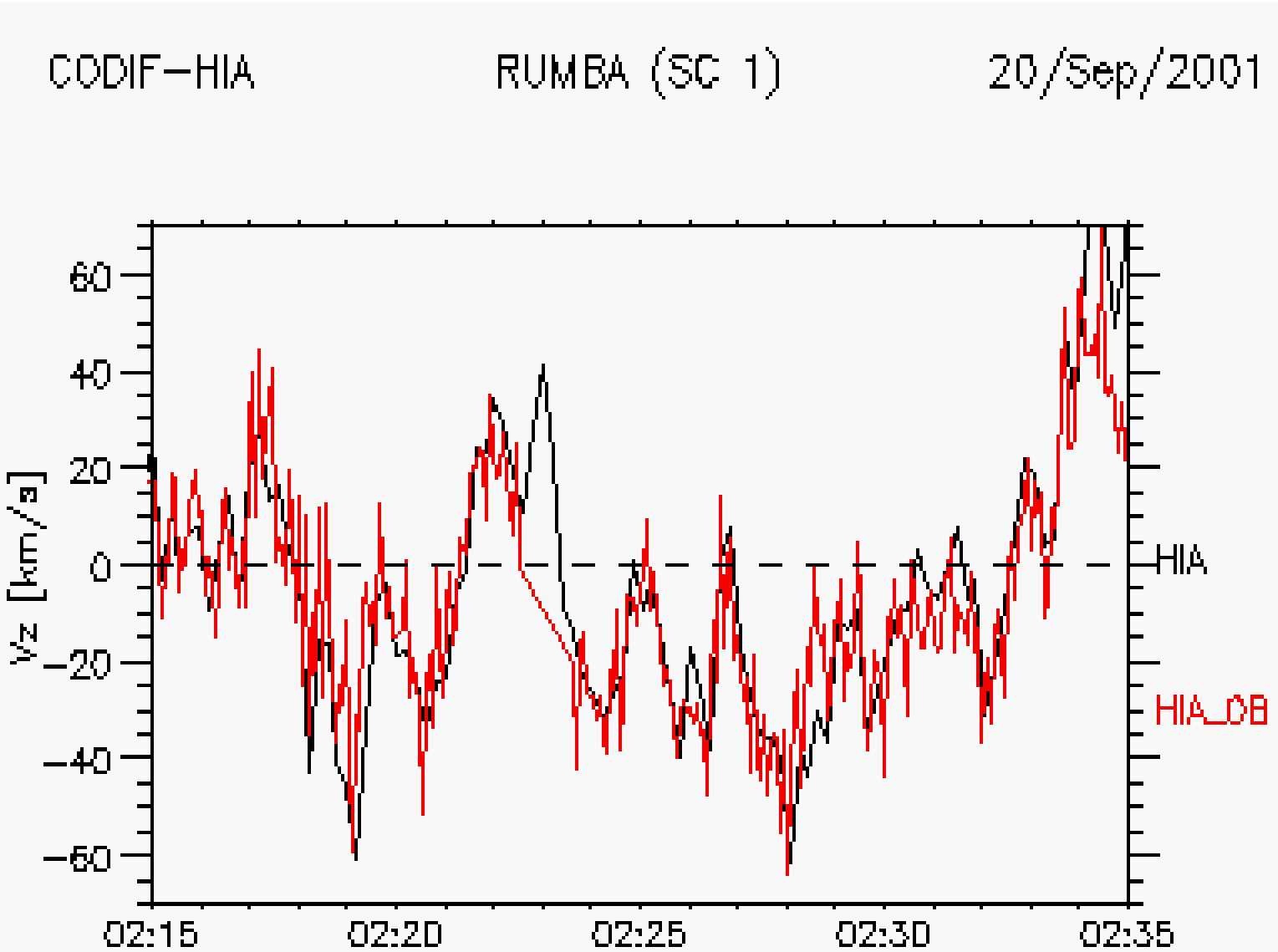
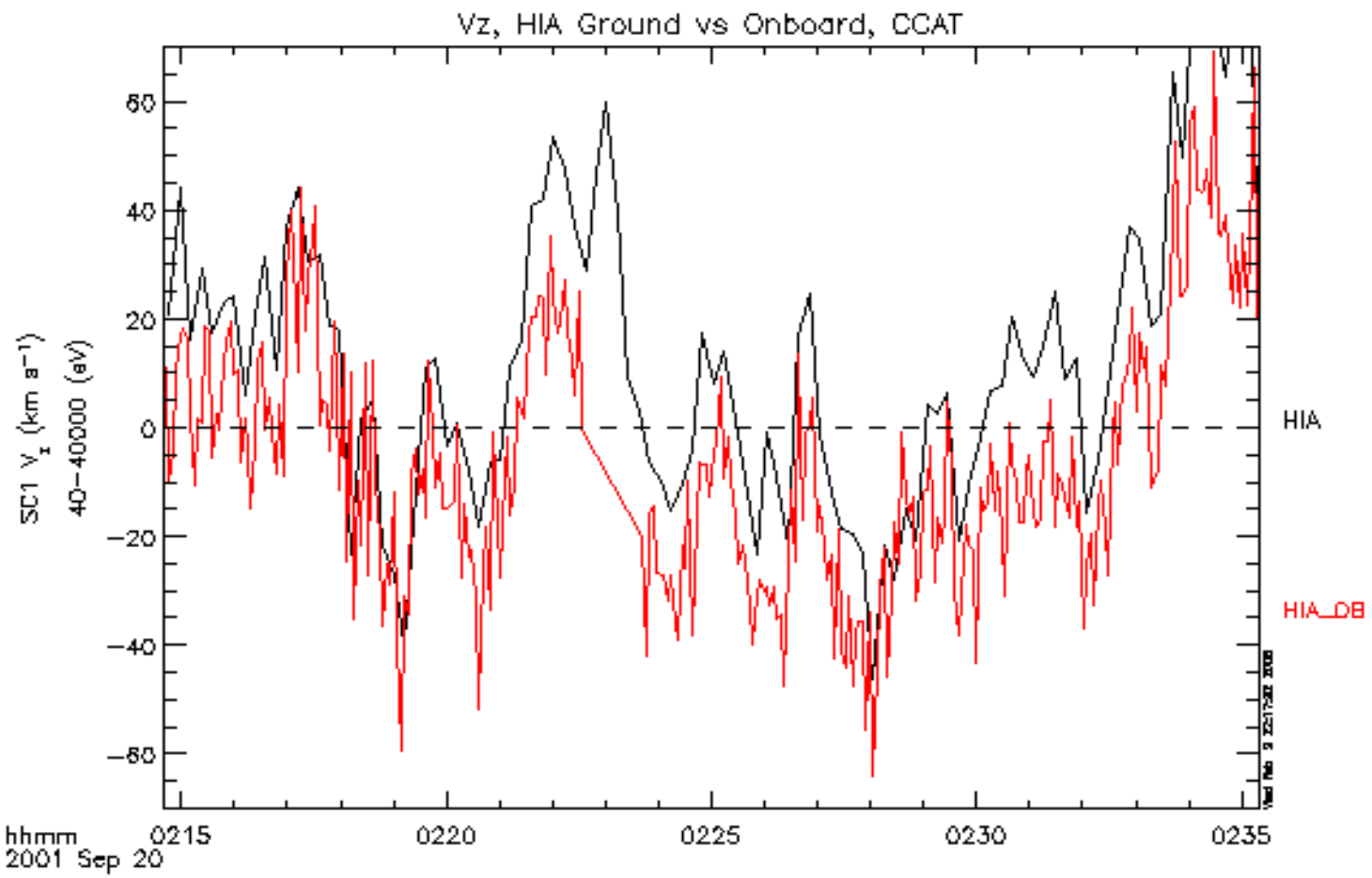
Preamble

- **E•J** computations with **E** derived as –**V** x **B**
- In the tail, with B≈30nT, a bias of ~30km/s in V_z implies a bias of ~1mV/m in E_y
- Consequently, we want to make sure that **V** is as good as possible
- In order to achieve this goal one needs:
  - Data from both CODIF and HIA, for cross-check
  - Accurate results from the processing software
  - Calibration as good as possible
- Problems:
  - CCAT and CL provide (sometimes significantly) different HIA grd. moments
  - Vz shows a negative tendency on SC1 and SC3, for CODIF and HIA-CL

CCAT vs CL


CODIF–HIA
RUMBA (SC 1)
20/Sep/2001
Vz [km/s]
60
40
20
0
−20
−40
−60
02:15
02:20
02:25
02:30
02:35
HIA
HIA_DB

A CCAT vs CL A


Vz, HIA Ground vs Onboard, CCAT
SC1 V_z (km s^{-1})
40-40000 (eV)
60
40
20
0
-20
-40
-60
HIA
HIA_OB
hhmm
2001 Sep 20
0215
0220
0225
0230
0235

A CCAT vs CL A

- The diff. energy flux is computed starting from the count number, N, by:

  $\Phi = N / dt\ G\ \varepsilon$, dt = integ. time, G = geom. factor, ε = efficiency = $\varepsilon_\theta\ \varepsilon_{MCP}$

- The difference between the CCAT and CL results is mainly related to ε_θ
- In CCAT $\varepsilon_{\theta\,i}$ are obtained by *cis_hia_efficiency*, which essentially reads them in the calibration file:

  $\varepsilon_{\theta i}^{CCAT} = \varepsilon_{\theta i}$

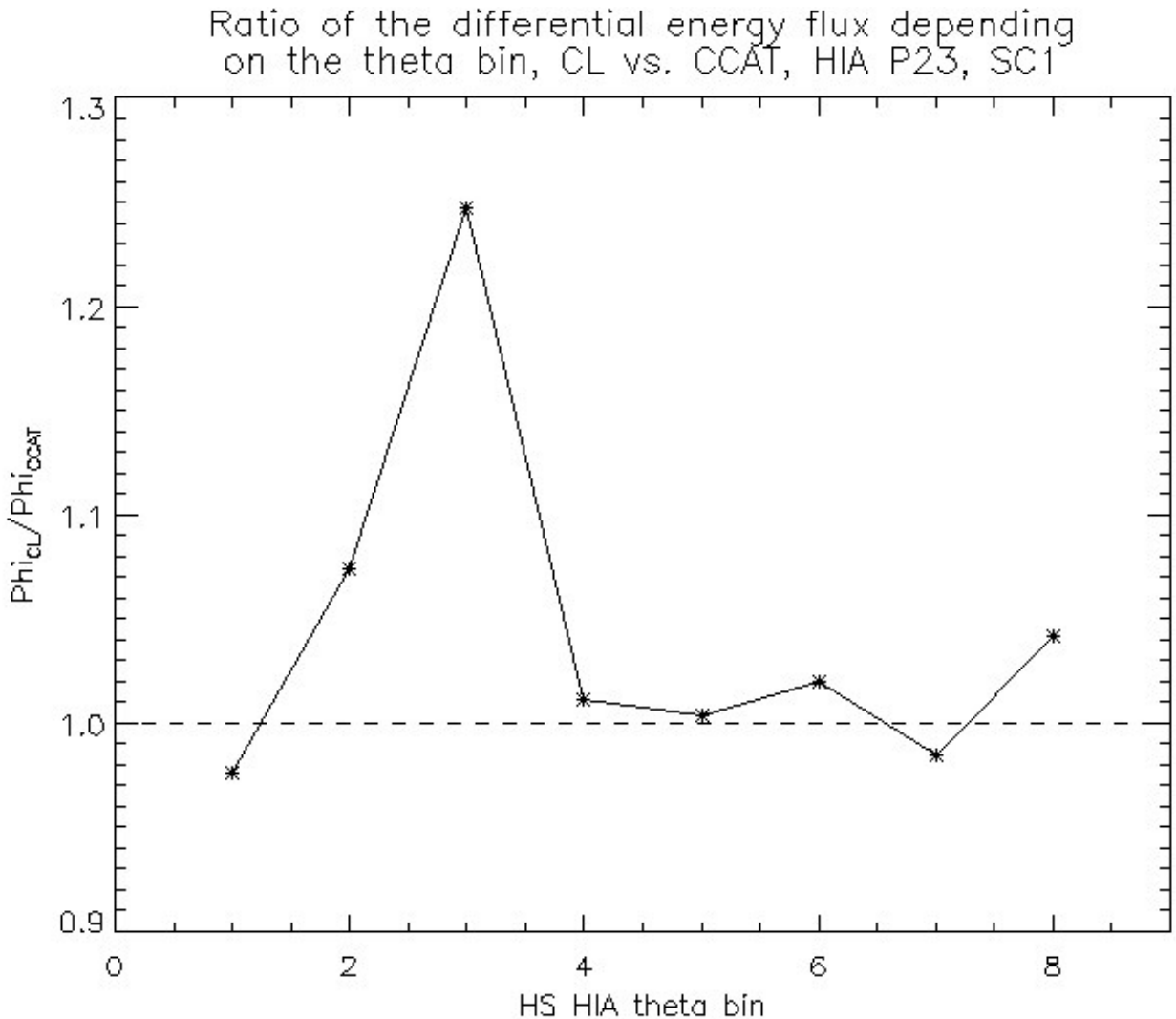
- In CL the function *CIS2calib_to_efficacite*, from *get_data3d.c* provides:

  $\varepsilon_{\theta ij}^{CL} = 1 / [(AE_j+B)\ N_\theta\ \varepsilon_{\theta i}]$, with A, B, and N_θ read in the calib. file

- The energy correction factor, $1 / (AE_j+B)$:
  - Is negligible for SC1 => decreases from 1.0005 to 0.9975 for increasing E.
  - It is significant for SC3 => increases from 0.946 to 1.091 for increasing E.
- The main difference between CCAT and CL results from the θ dependence:

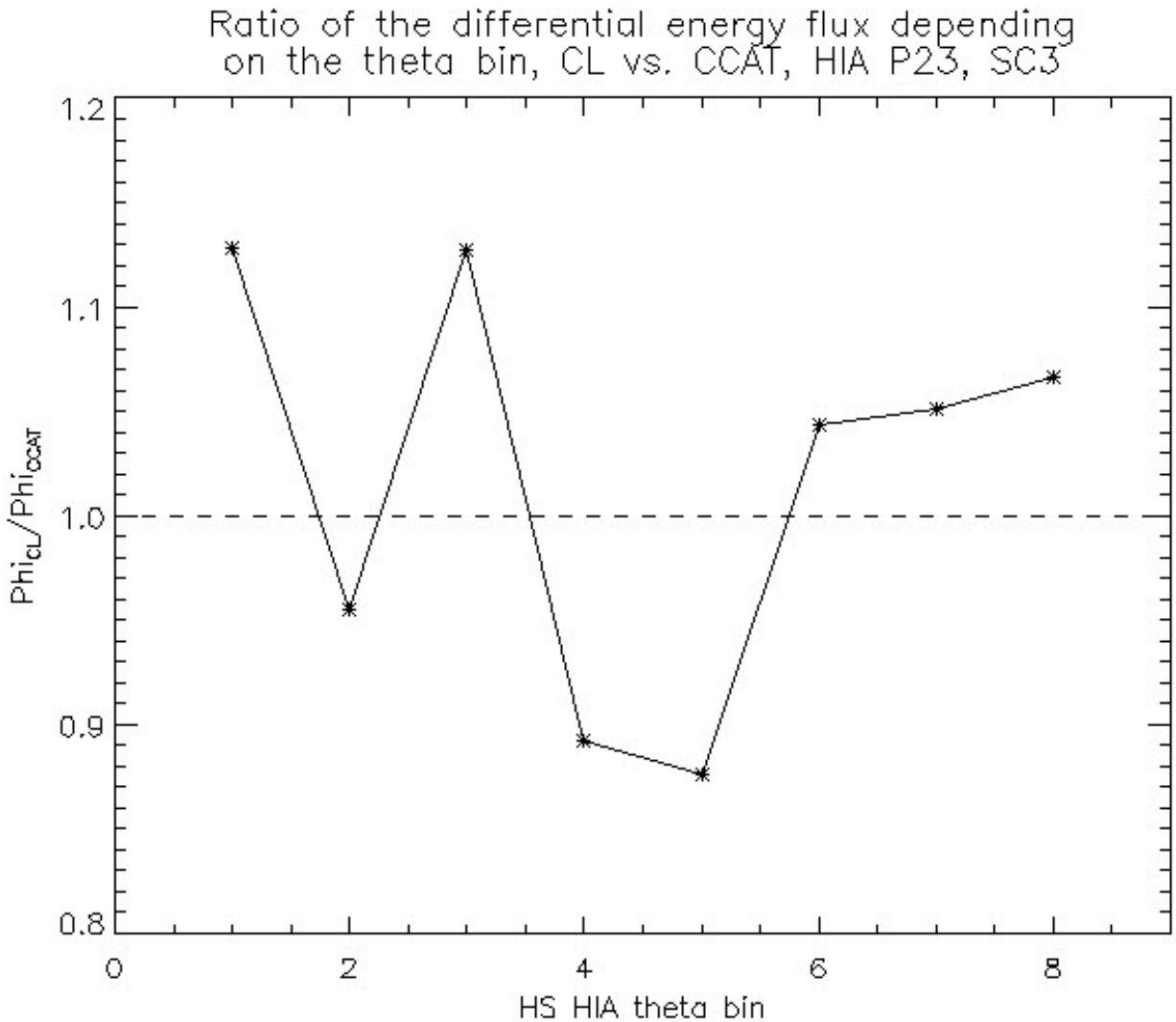
  $(\Phi^{CL} / \Phi^{CCAT})_i = N_\theta\ \varepsilon^2_{\theta\,i}$

A CCAT vs CL A



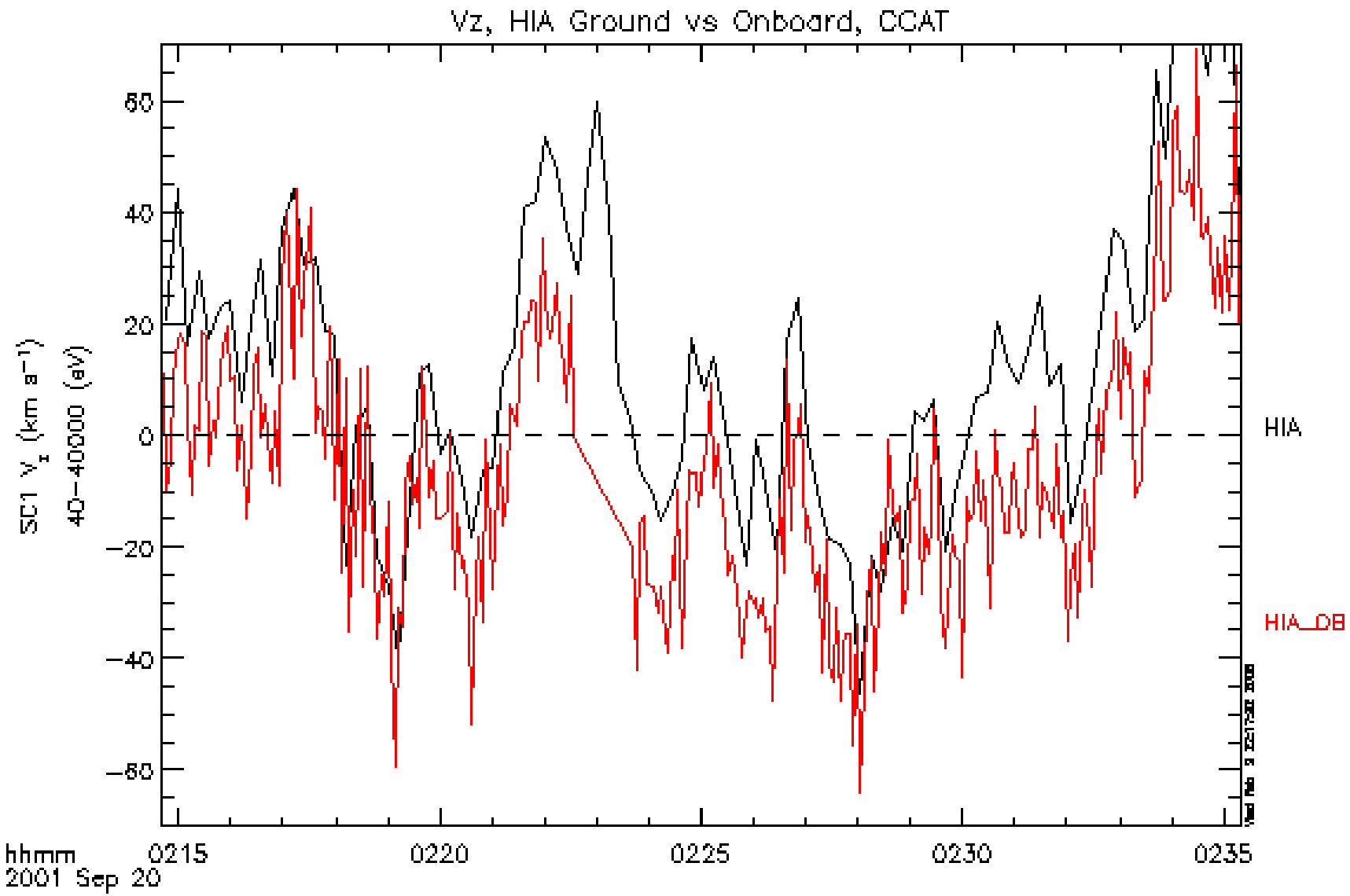
➢ For SC1, the prominent peak at θ_3 (~25% difference in the fluxes) explains the difference in the velocity as well as the typically larger density obtained by CL

A CCAT vs CL A

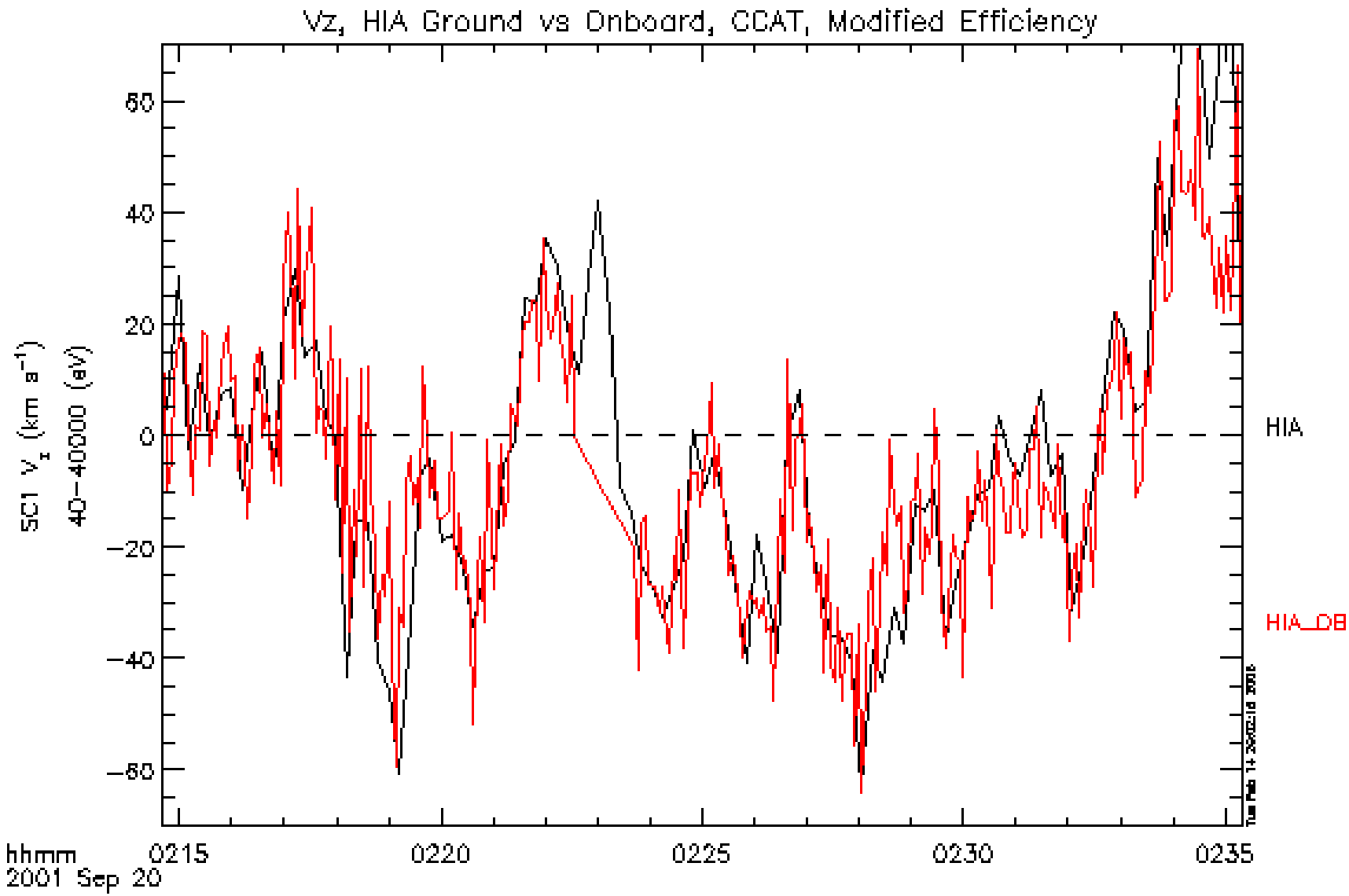


➢ For SC3 the difference between diff. energy fluxes is more evenly distributed around 1, which explains why the macroscopic effects are less pronounced.

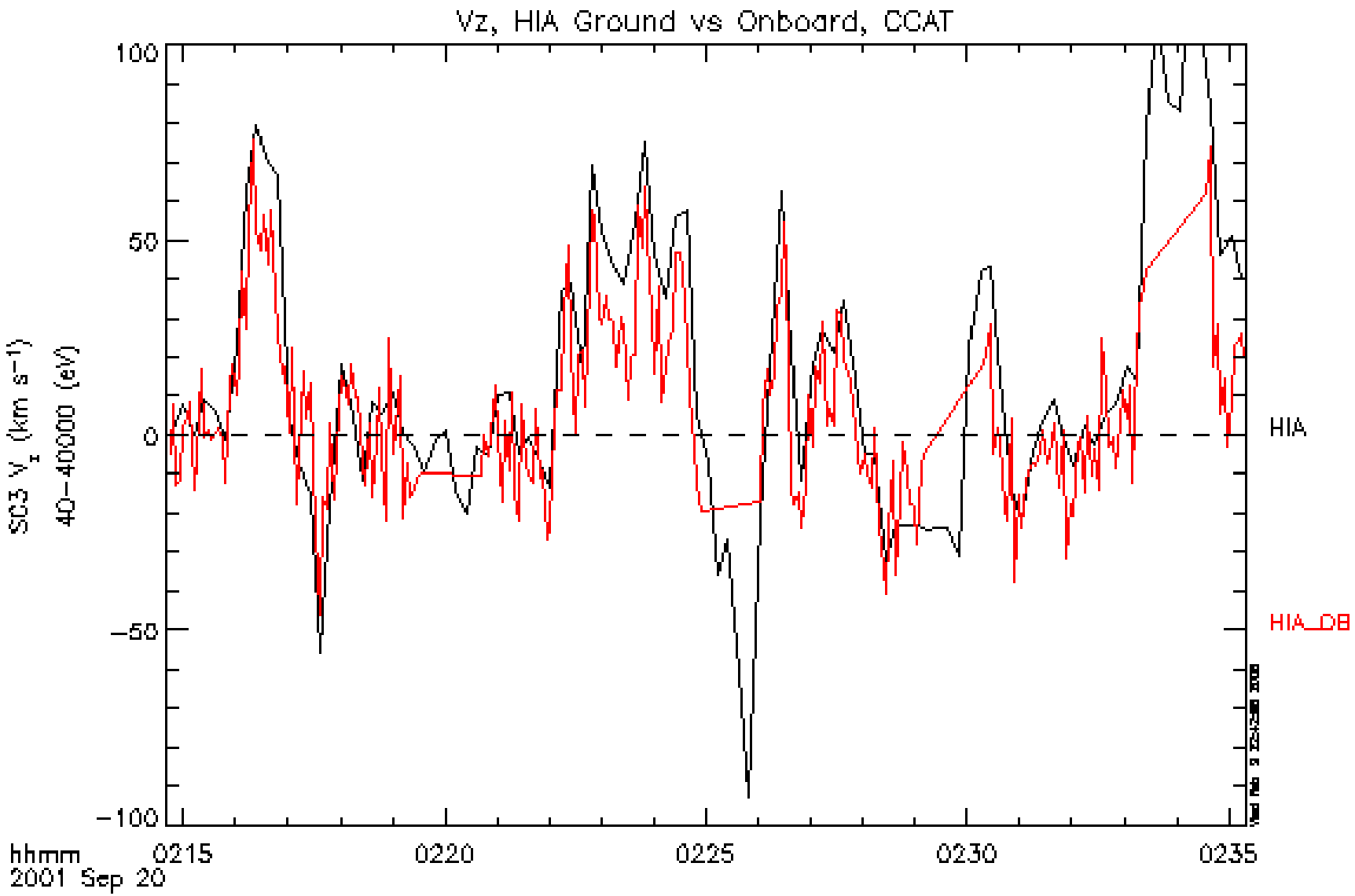
A CCAT vs CL A


Vz, HIA Ground vs Onboard, CCAT
SC1 V_z (km s^{-1})
40-40000 (eV)
60
40
20
0
−20
−40
−60
HIA
HIA_OB
hhmm
2001 Sep 20
0215
0220
0225
0230
0235

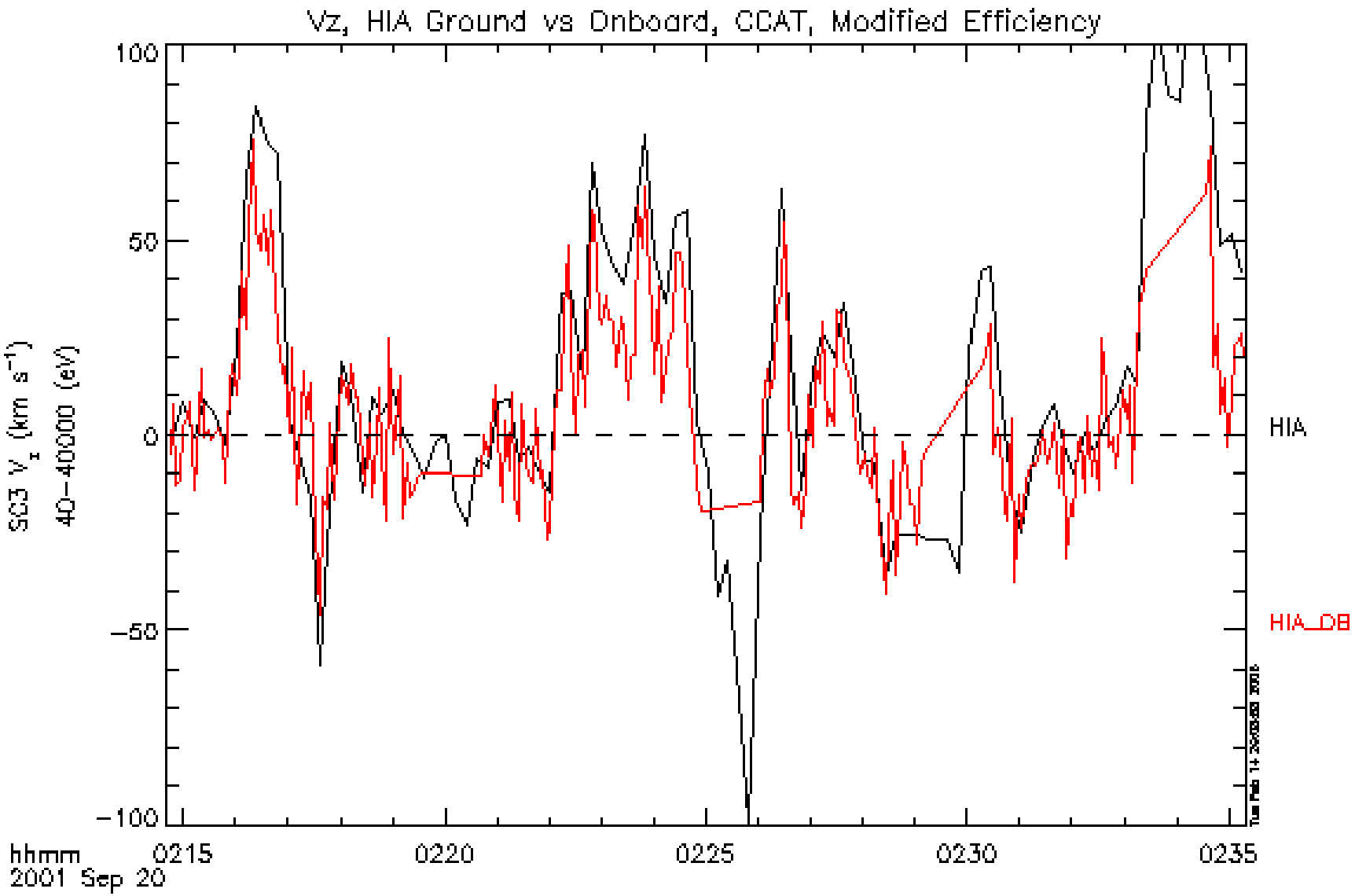
A CCAT vs CL A


Vz, HIA Ground vs Onboard, CCAT, Modified Efficiency
SC1 V_z (km s^{-1})
40-40000 (eV)
60
40
20
0
-20
-40
-60
HIA
HIA_OB
hhmm
2001 Sep 20
0215
0220
0225
0230
0235

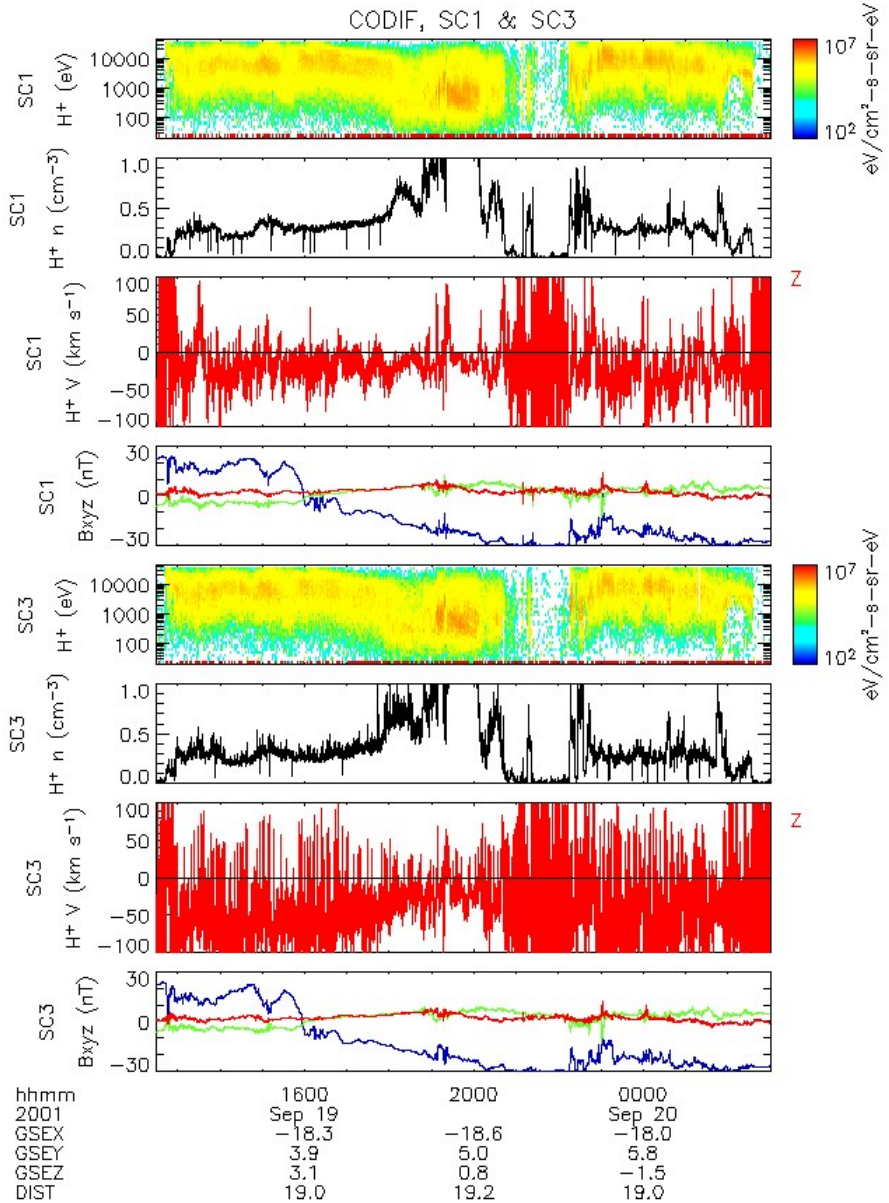
A CCAT vs CL A

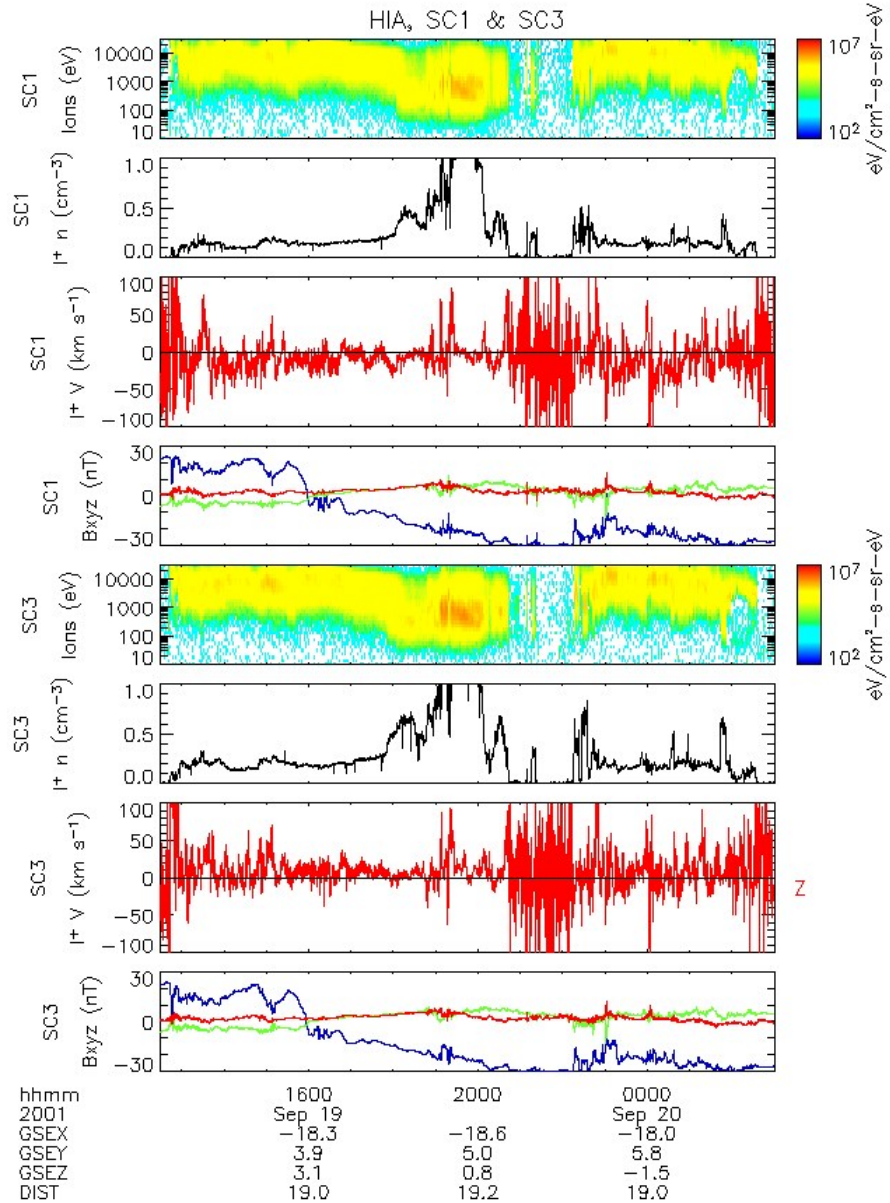

Vz, HIA Ground vs Onboard, CCAT
100
50
0
−50
−100
SC3 V_x (km s^{-1})
40–40000 (eV)
HIA
HIA_OB
hhmm
2001 Sep 20
0215
0220
0225
0230
0235

A CCAT vs CL A

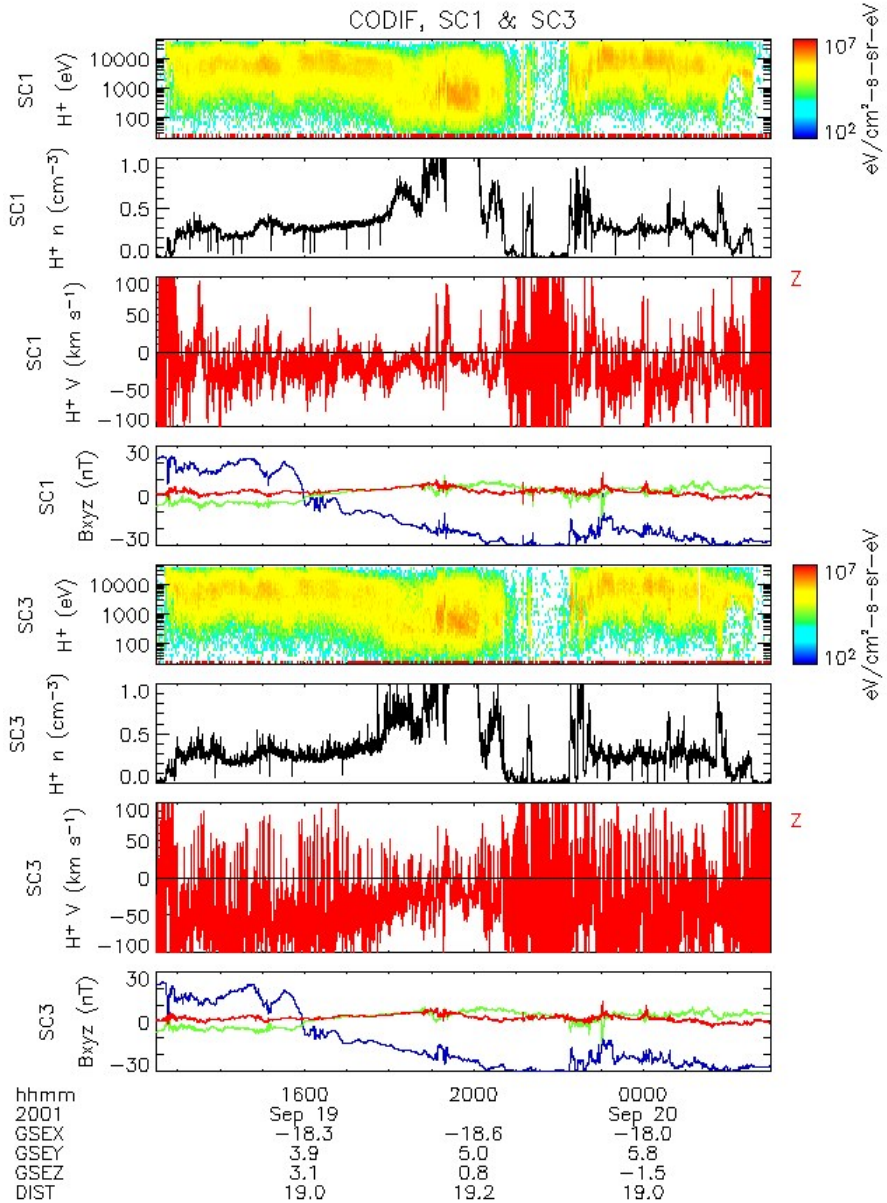

Vz, HIA Ground vs Onboard, CCAT, Modified Efficiency
100
50
0
−50
−100
SC3 V_z (km s^{-1})
40−40000 (eV)
HIA
HIA_OB
hhmm
2001 Sep 20
0215
0220
0225
0230
0235

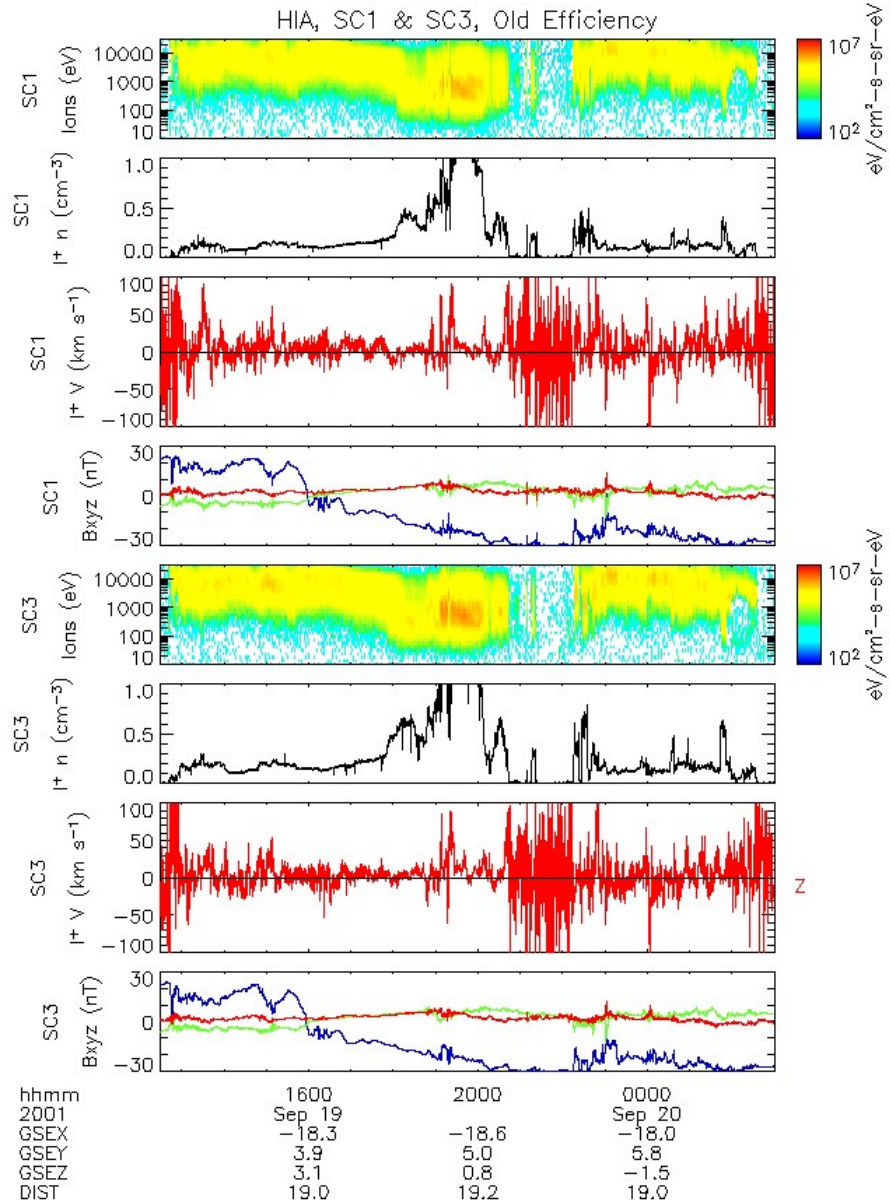
B Calibration B



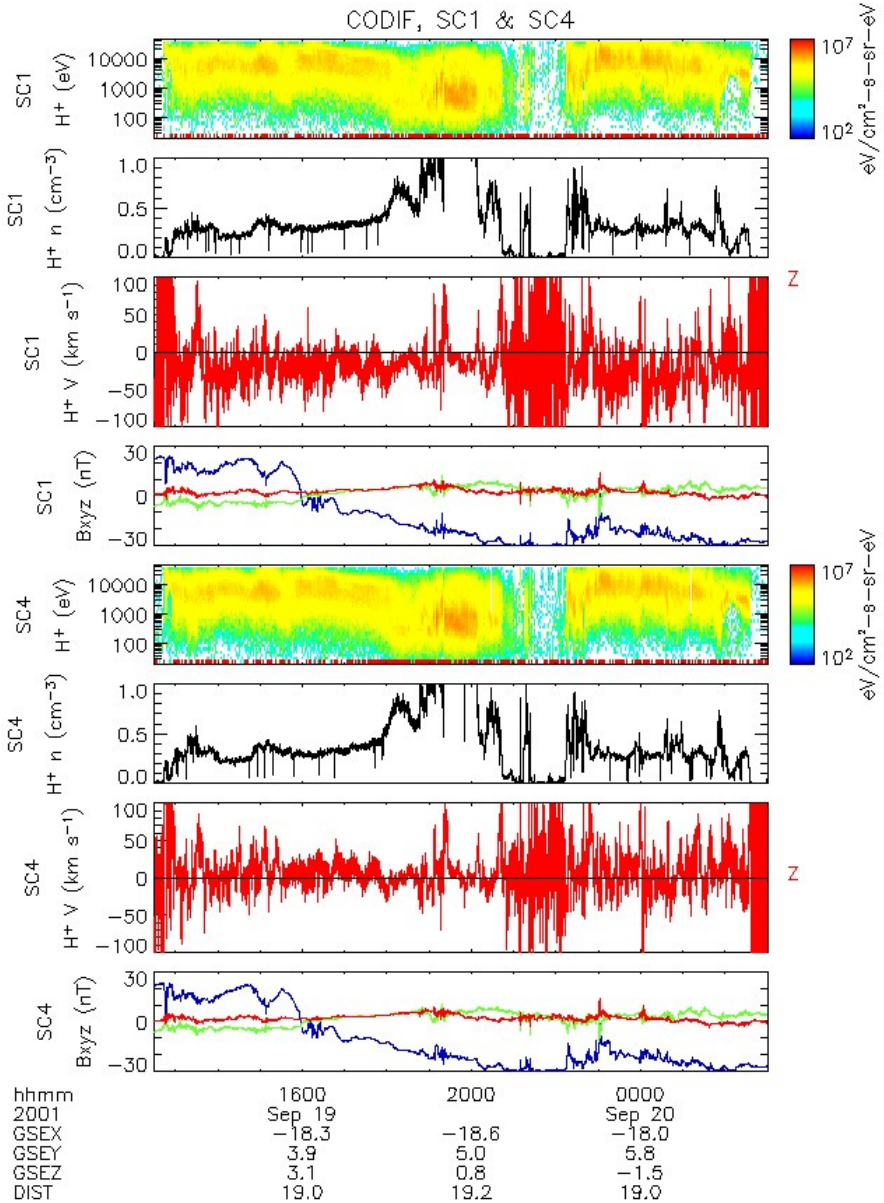


B Calibration B





B Calibration B



C Conclusions C

- The agreement between the ground and onboard HIA data suggests that CCAT should adopt the same efficiency formula as CL.
- The agreements between CODIF and HIA suggests, as well, a change in CCAT.
- On the other hand, the negativ bias in the velocity suggests that one should change CL, for both onboard and ground HIA data.
- Alternatively, if CL is fine, the HIA calibration on SC1 should be adjusted.
- The CODIF calibration on SC1 and SC3 seems to need adjustments as well, at least for H+.