

*health physics division
risk and safety*

TEPC Reference Measurements at Aircraft Altitudes during a Solar Storm

P. Beck, M. Latocha, S. Rollet, and G. Stehno

ARC Seibersdorf research, 2444 Seibersdorf, Austria

Health Physics Division

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seibersdorf research

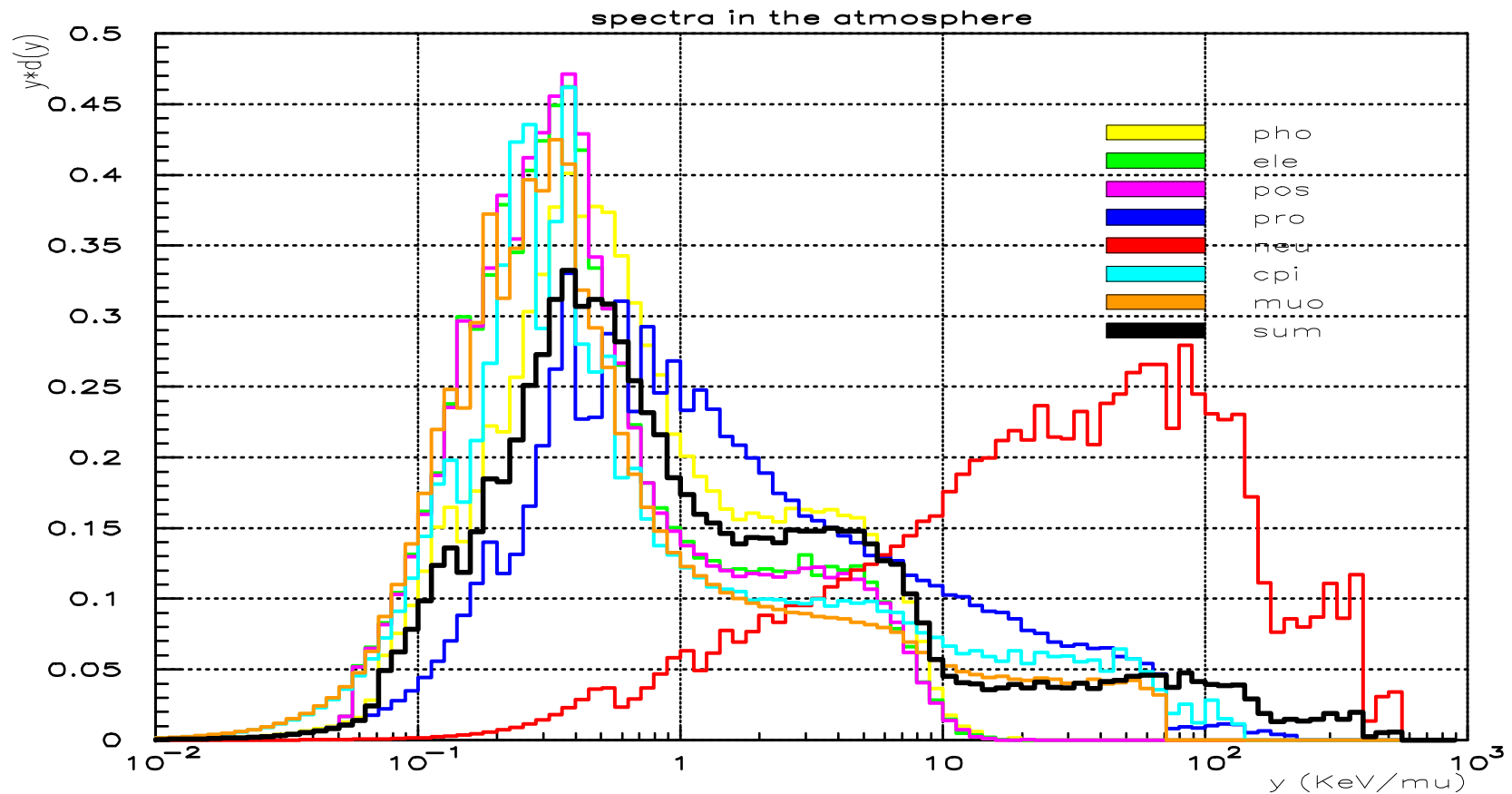
Tissue Equivalent Proportional Counter: TEPC

- Sphere of tissue equivalent **A150** plastic
- **Low pressure** propane gas
- LET of **2 μm** diameter tissue
- Measure in **mixed** radiation field:
 - **absorbed dose**
 - **dose equivalent**
 - **LET distribution**

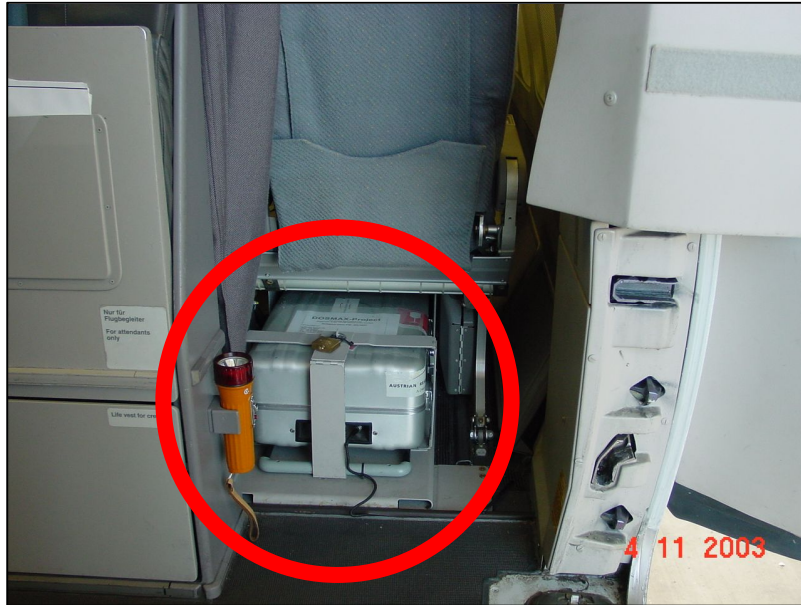
Far West Technologies: **HAWK** →



TEPC FLUKA Simulations: Cosmic Ray Field

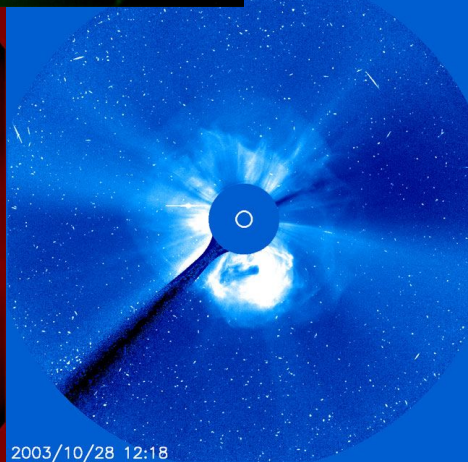
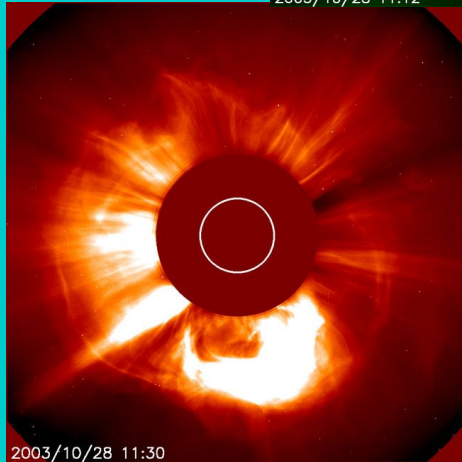
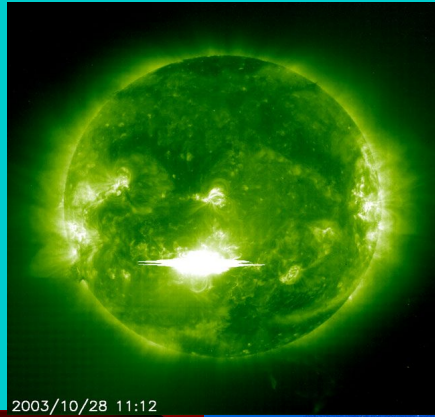


TEPC-HAWK on board Lufthansa Aircraft

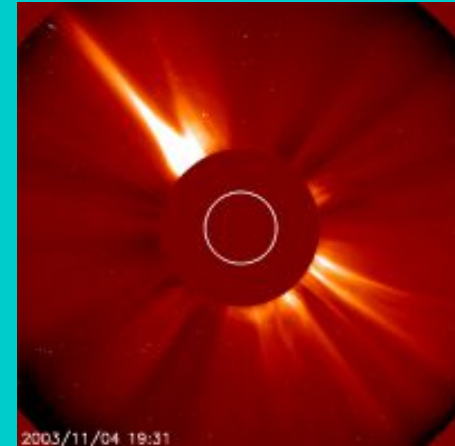
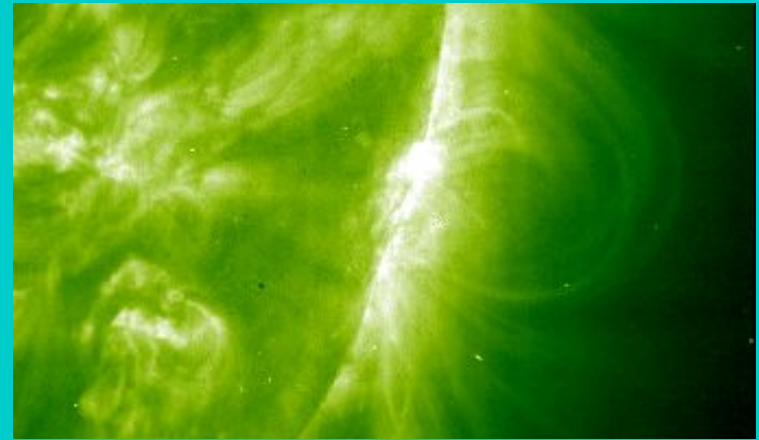


Solar Storm 2003 – SOHO Images

October 28, 2003

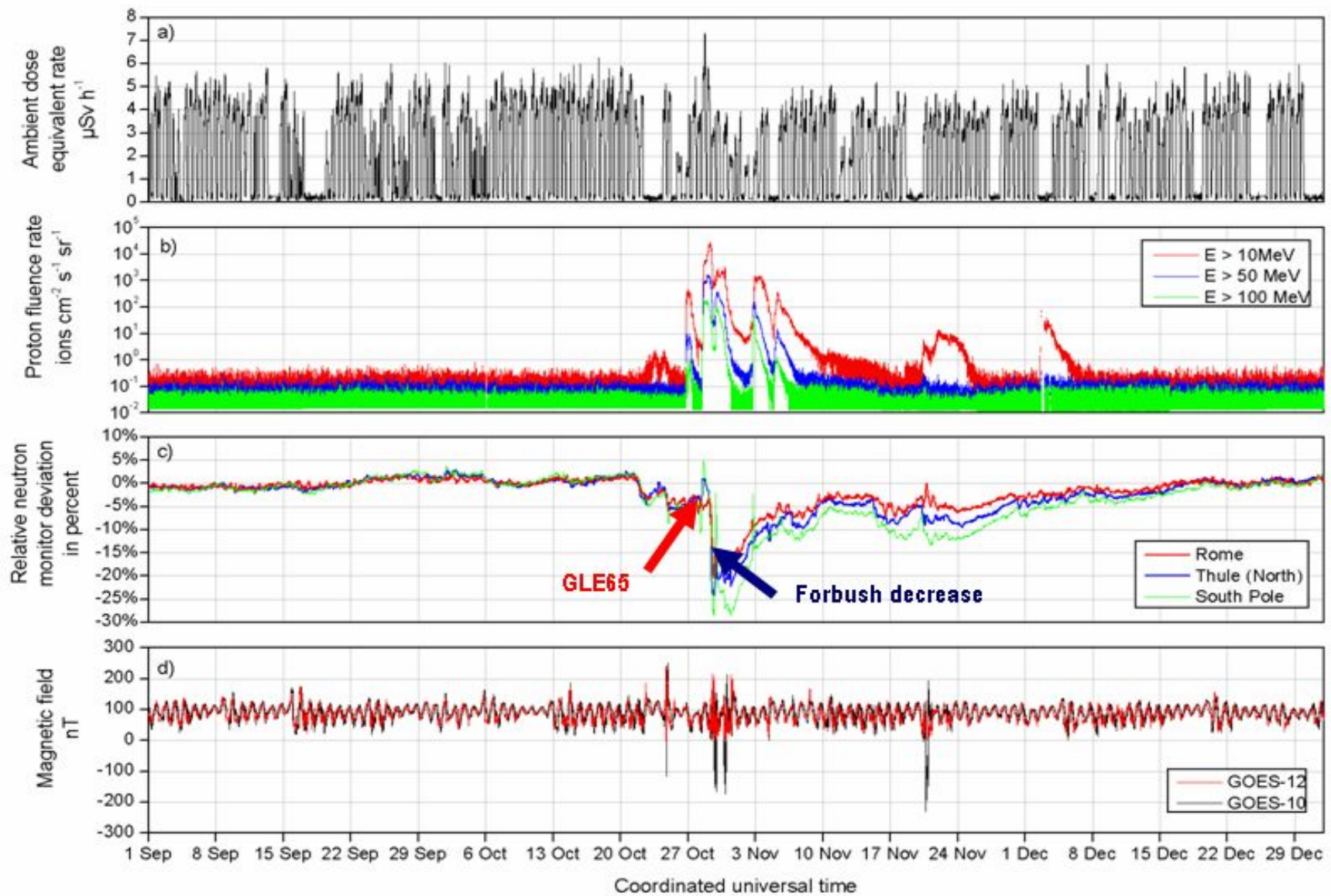


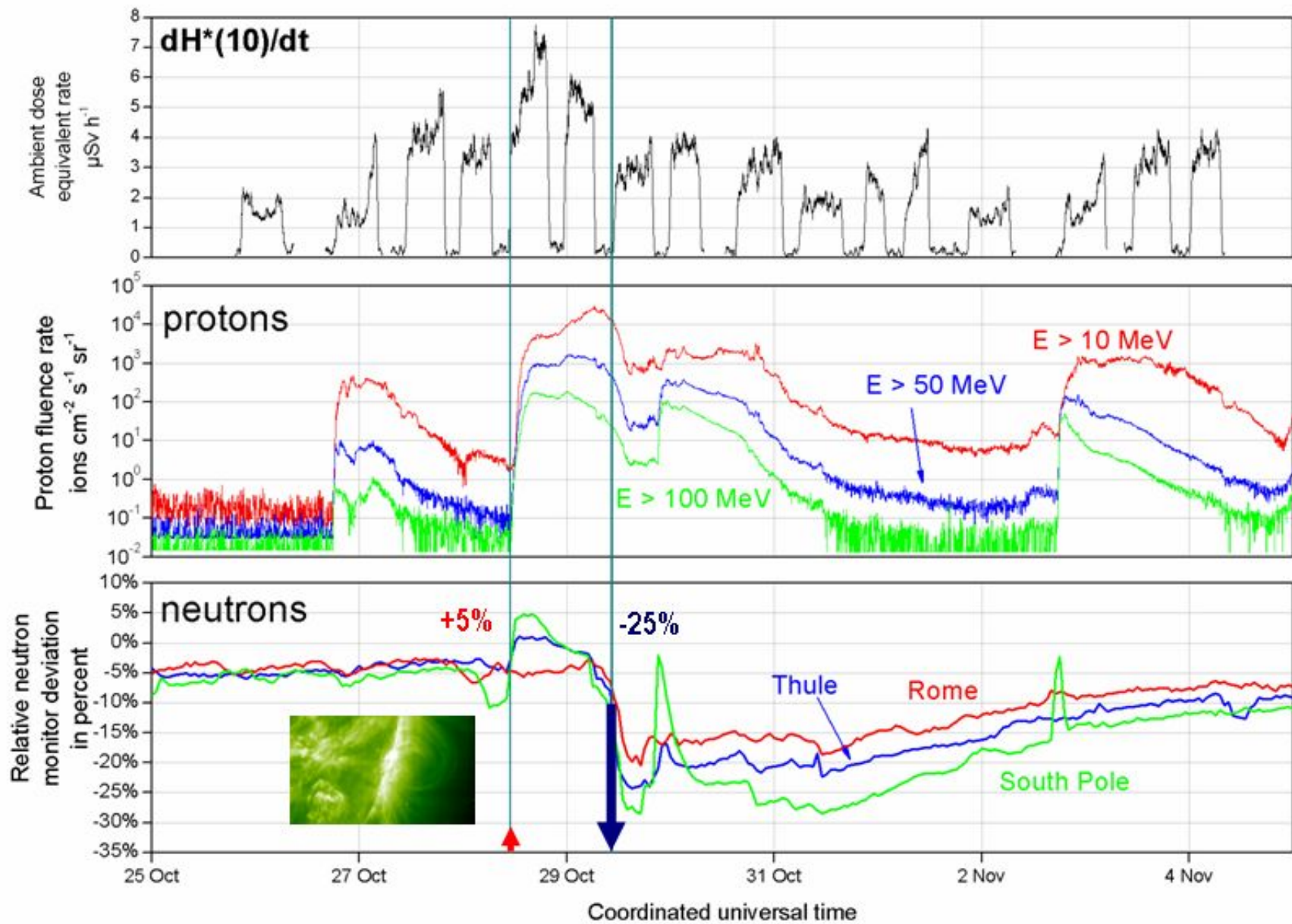
November 4, 2003

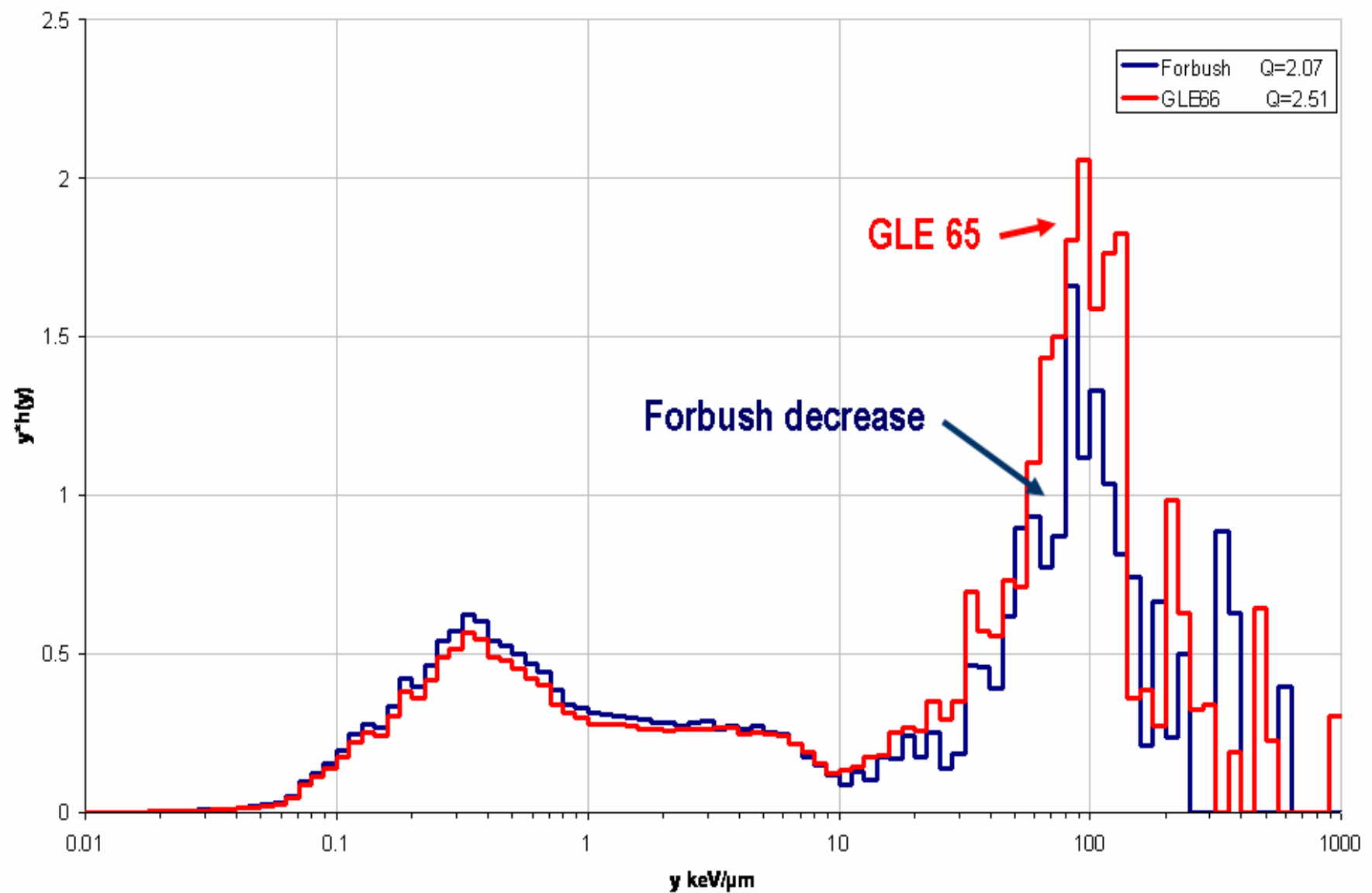


In-Flight Investigations

- August 1, 2003 – December 31, 2003: **152 days**
- **257 flights**
- **2430 flight hours**
- Selected flight route: **Munich – Chicago**
- Cut-Off: **0.5 GV – 4GV**
- Mean cruising altitude: **FL 350 (meter)**
- Selected flights:
 - August 17, 2003: **reference flight**
 - October 28, 2003: **GLE 65**
 - October 29, 2003: **Forbush decrease**

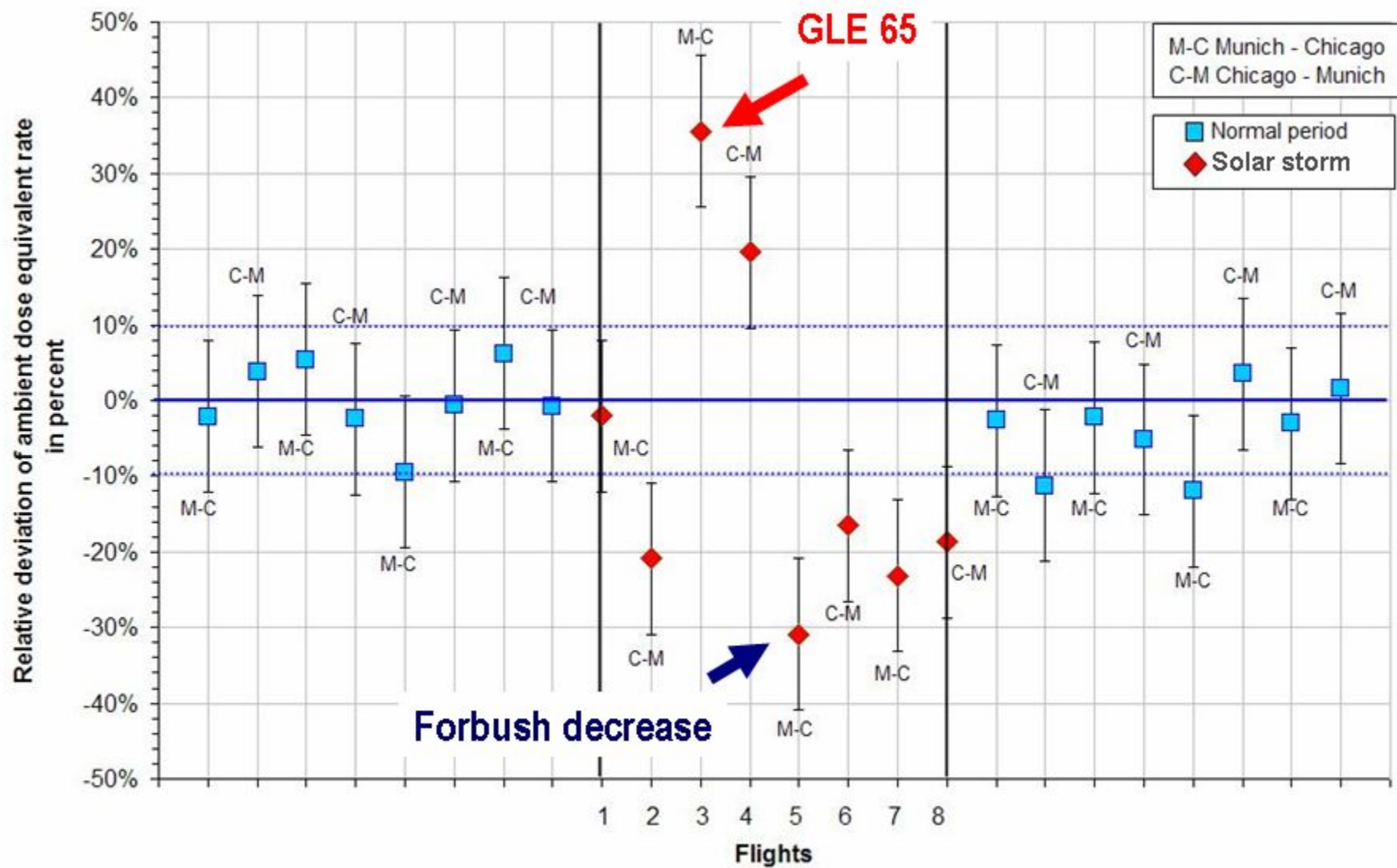


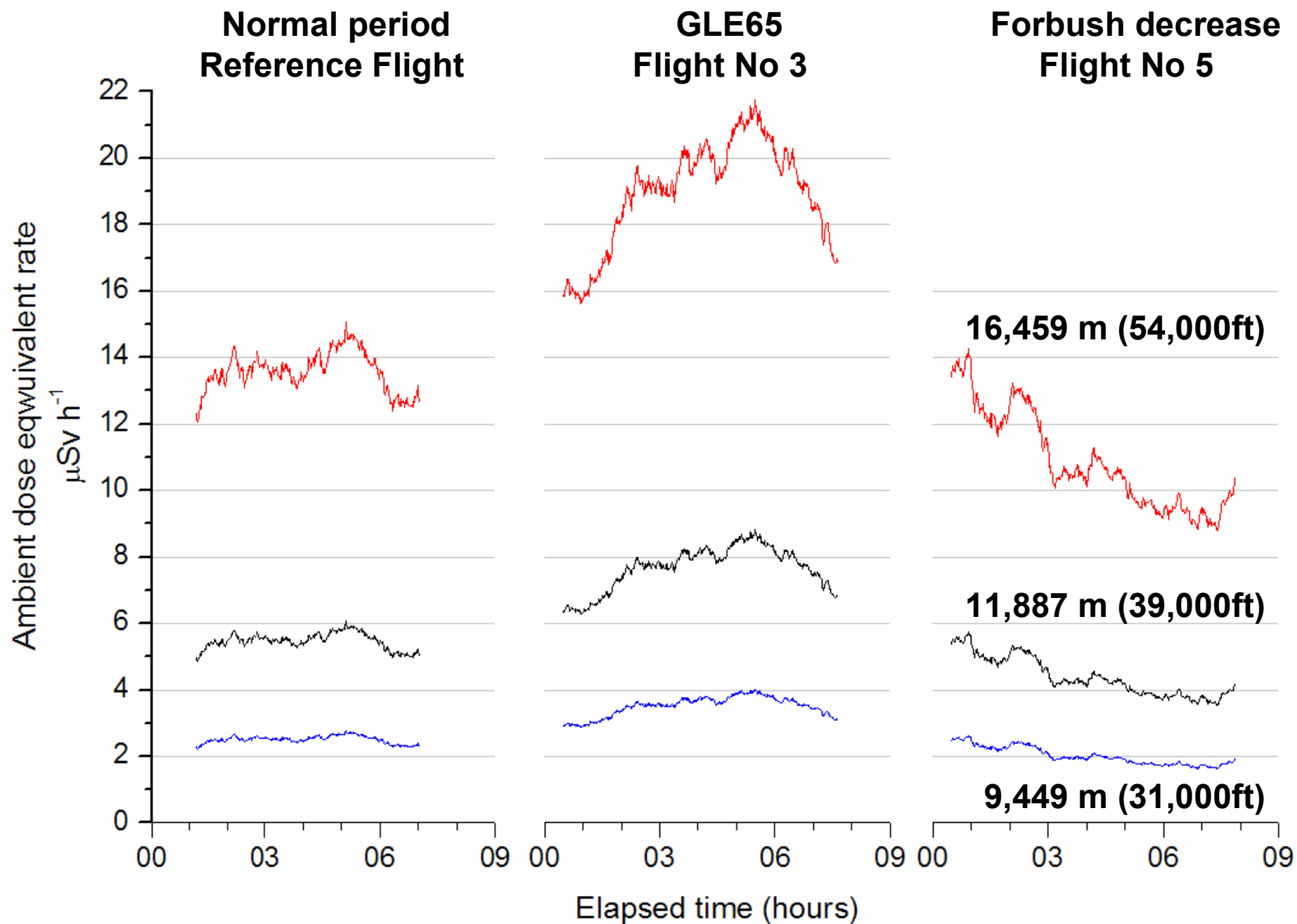




Ambient Dose Equivalent / Rate

Flight: Munich – Chicago	$dH^*(10)/dt$ $\mu\text{Sv/h}$ <i>Average cruising</i>	$dH^*(10)/dt$ $\mu\text{Sv/h}$ <i>Norm. 350 FL</i>	$H^*(10)$ μSv	k_{Dev}	Q
Reference flight	4.2 (0.42)	4.1 (0.41)	35	1	2.21
GLE 65	5.7 (0.57)	5.6 (0.56)	50	1.35	2.51
Forbush decrease	2.9 (0.29)	3.0 (0.30)	26	0.69	2.07





Conclusion

- **Oct / Nov 2003 event** dose deviation $\pm 35\%$
- **Quality factor Q:** 2 to 2.5
- Focus of authorities (**FAA**) and aircrew – web **rumor groups** on SPE
- Prediction of doses for worst case in EC-CONRAD project
- Verification by **on-board measurements** needed
- Suggested measurement **network (EURADOS WG5)**