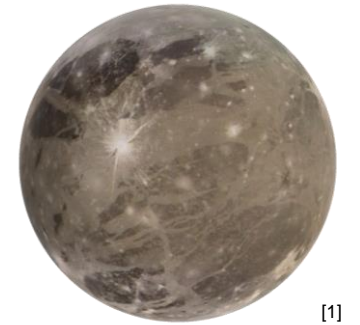
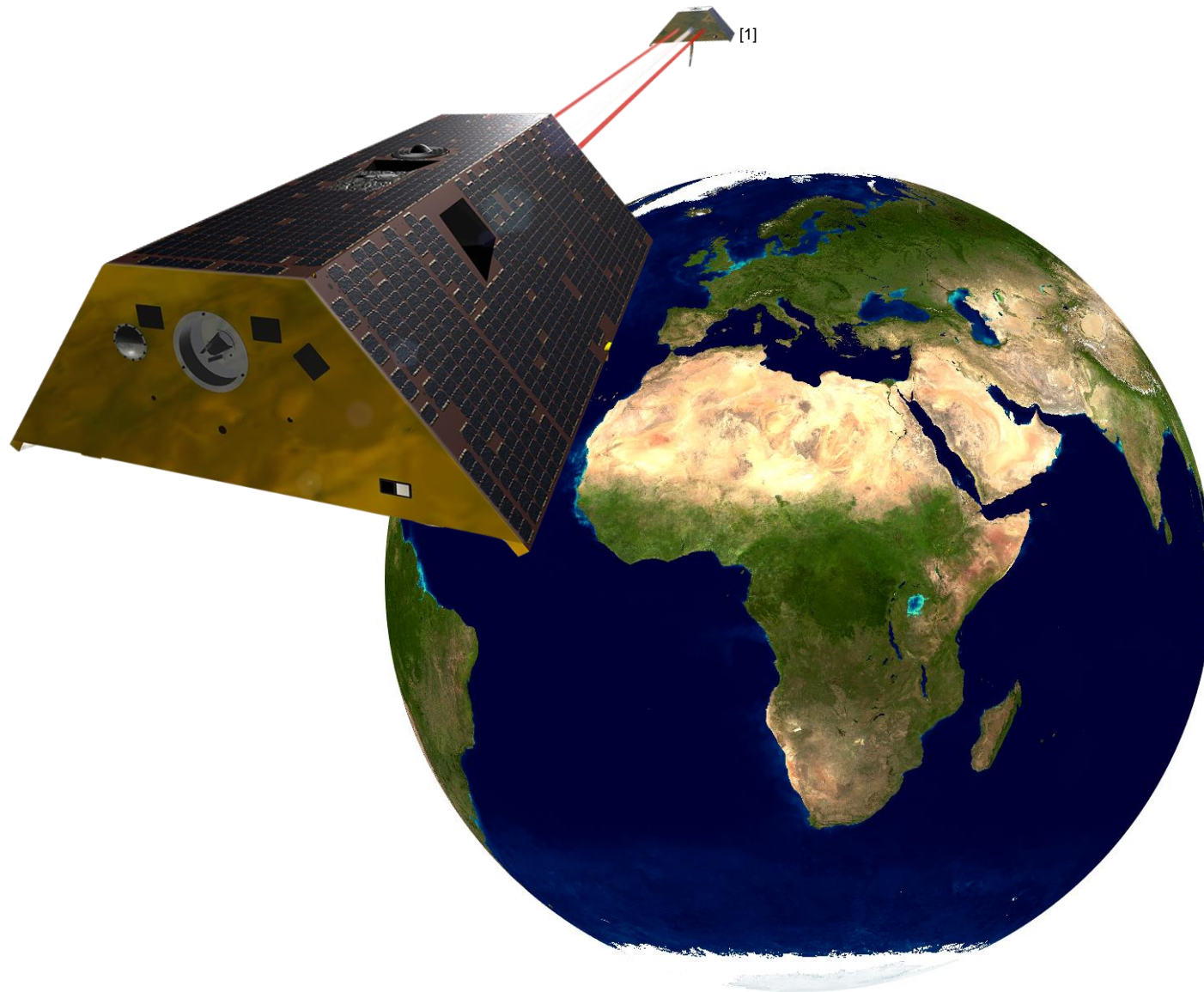


SENSOR DATA SIMULATIONS FOR A FUTURE DEDICATED SATELLITE GRAVIMETRY MISSION AT MARS

Marvin Bredlau, Stefanie Bremer, Alexander Koch, Andreas Leipner, Manuel Schilling, Matthias Weigelt, Lisa Wörner

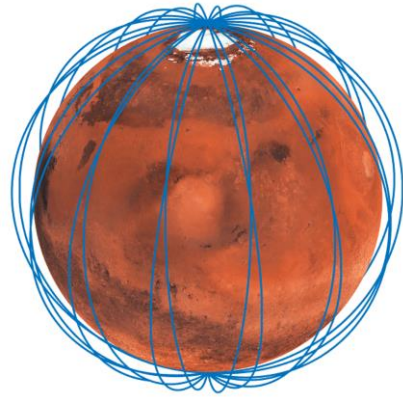
DLR Institute for Satellite Geodesy and Inertial Sensing - Hannover



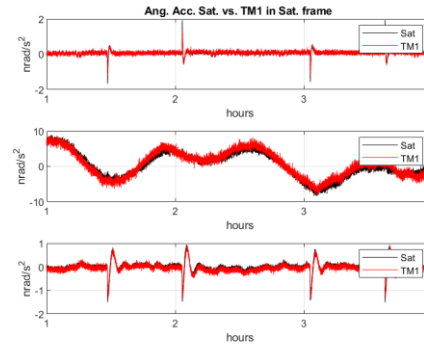


[1] NASA

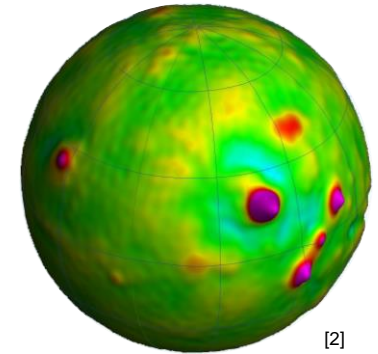
Goal: Simulation Chain



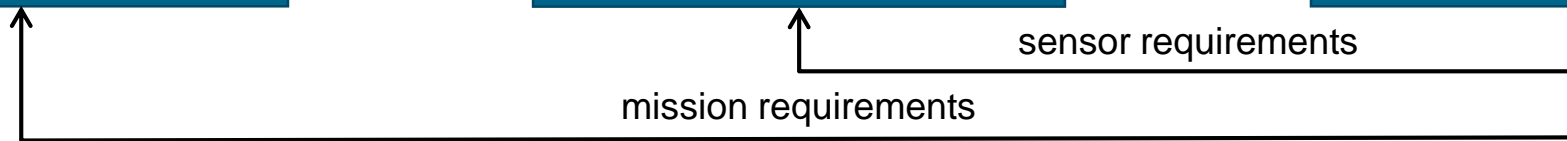
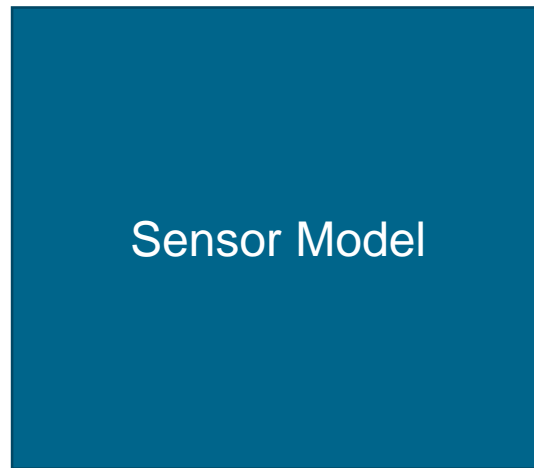
satellite orbit



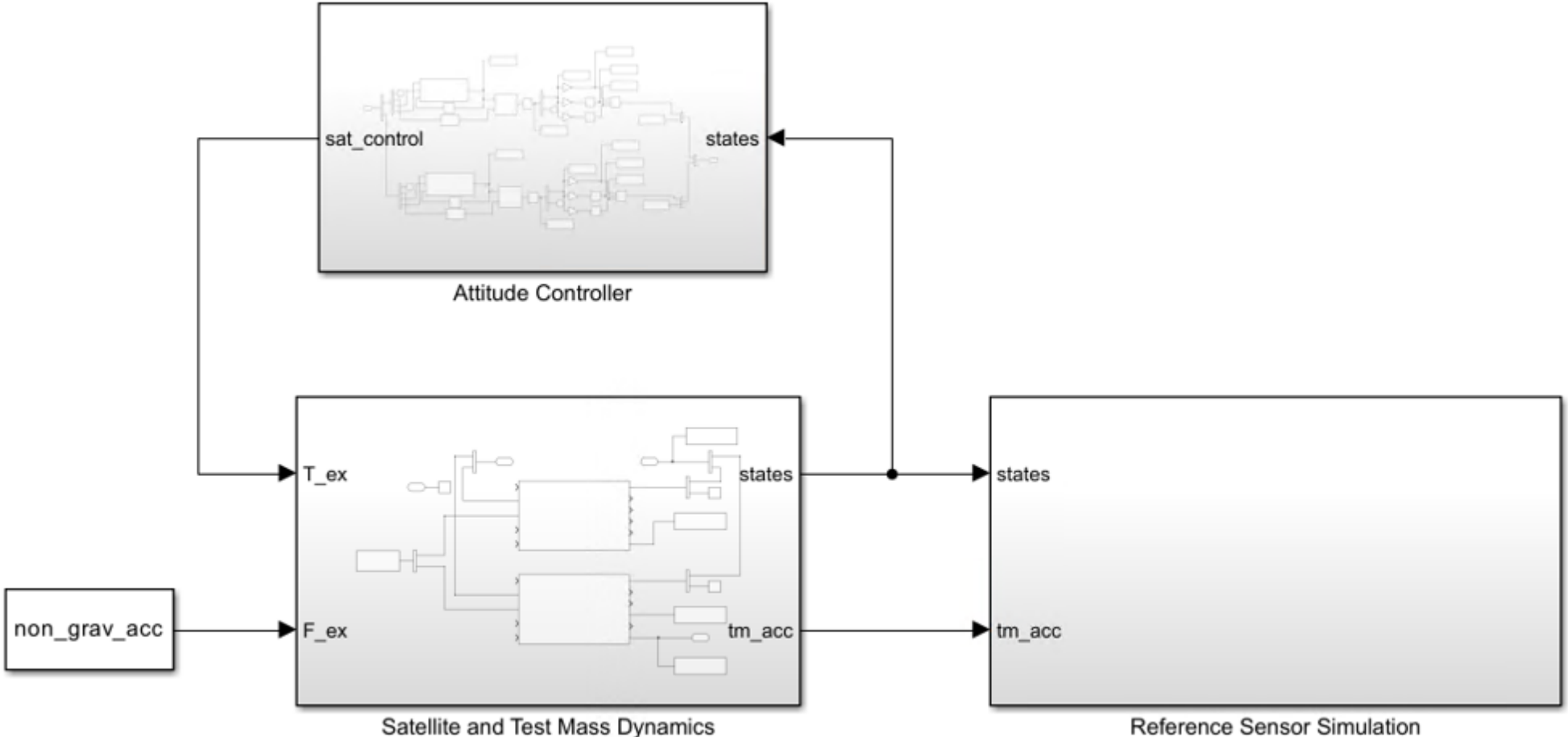
sensor data



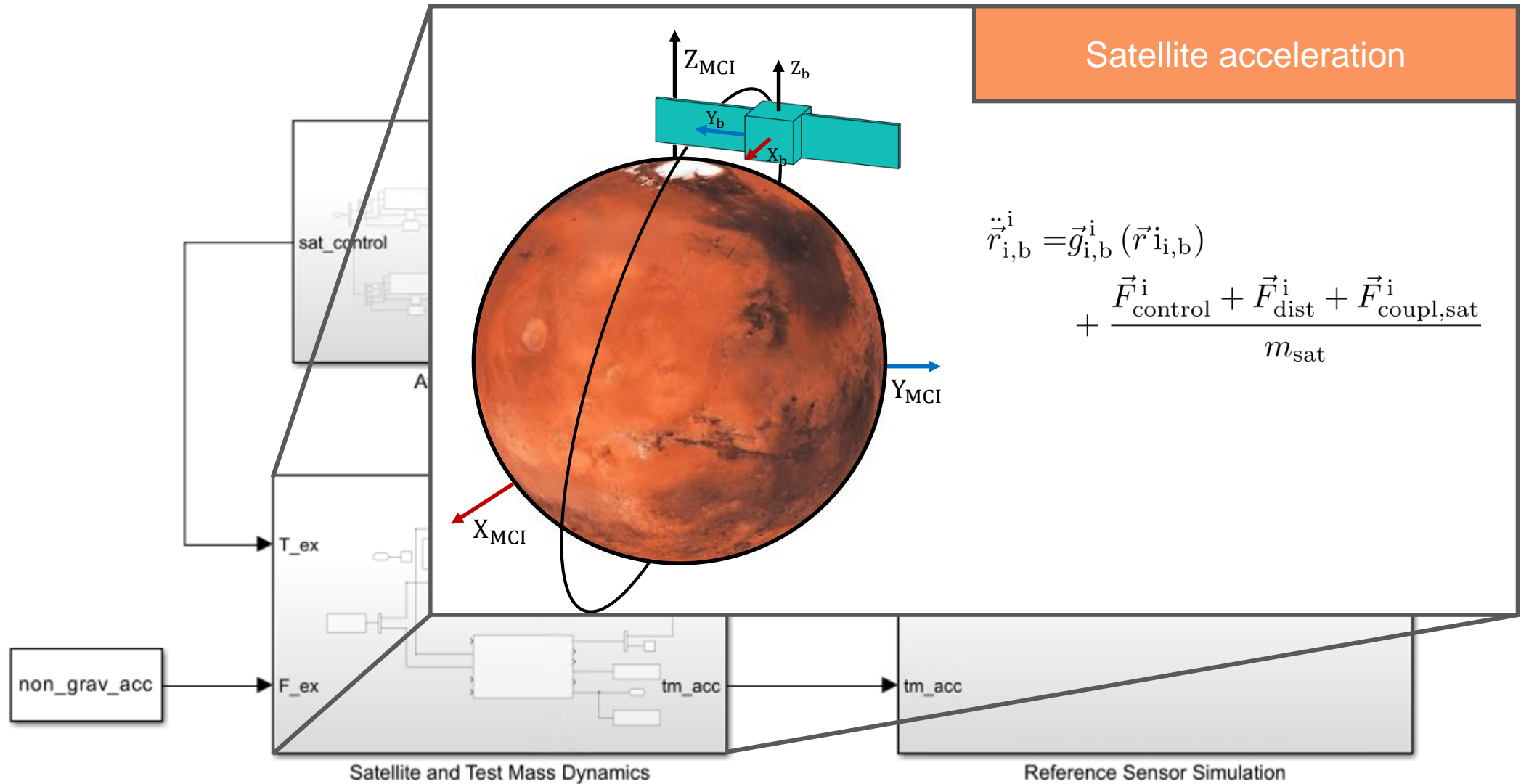
gravity field



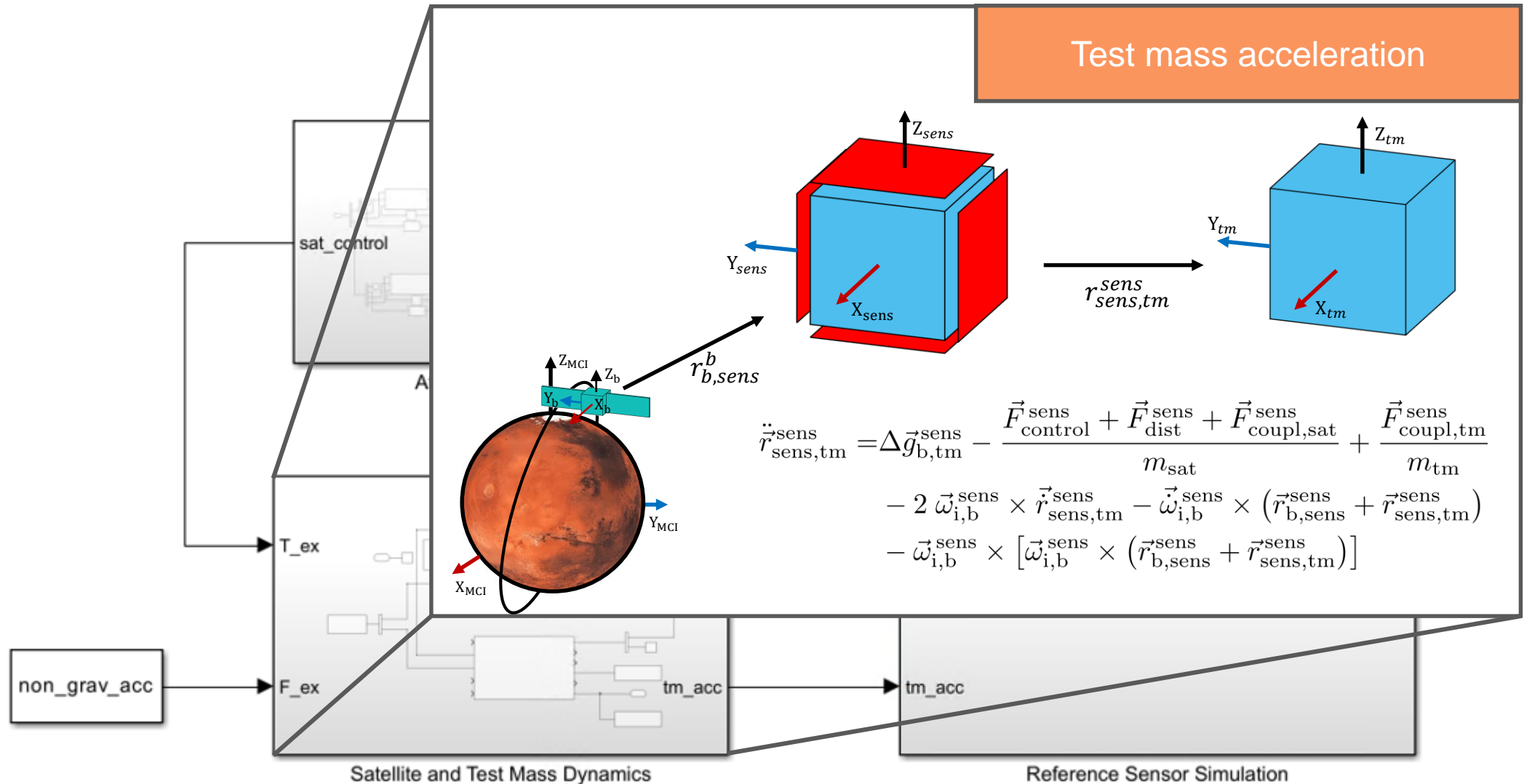
Simulation with VENQS[®] Software



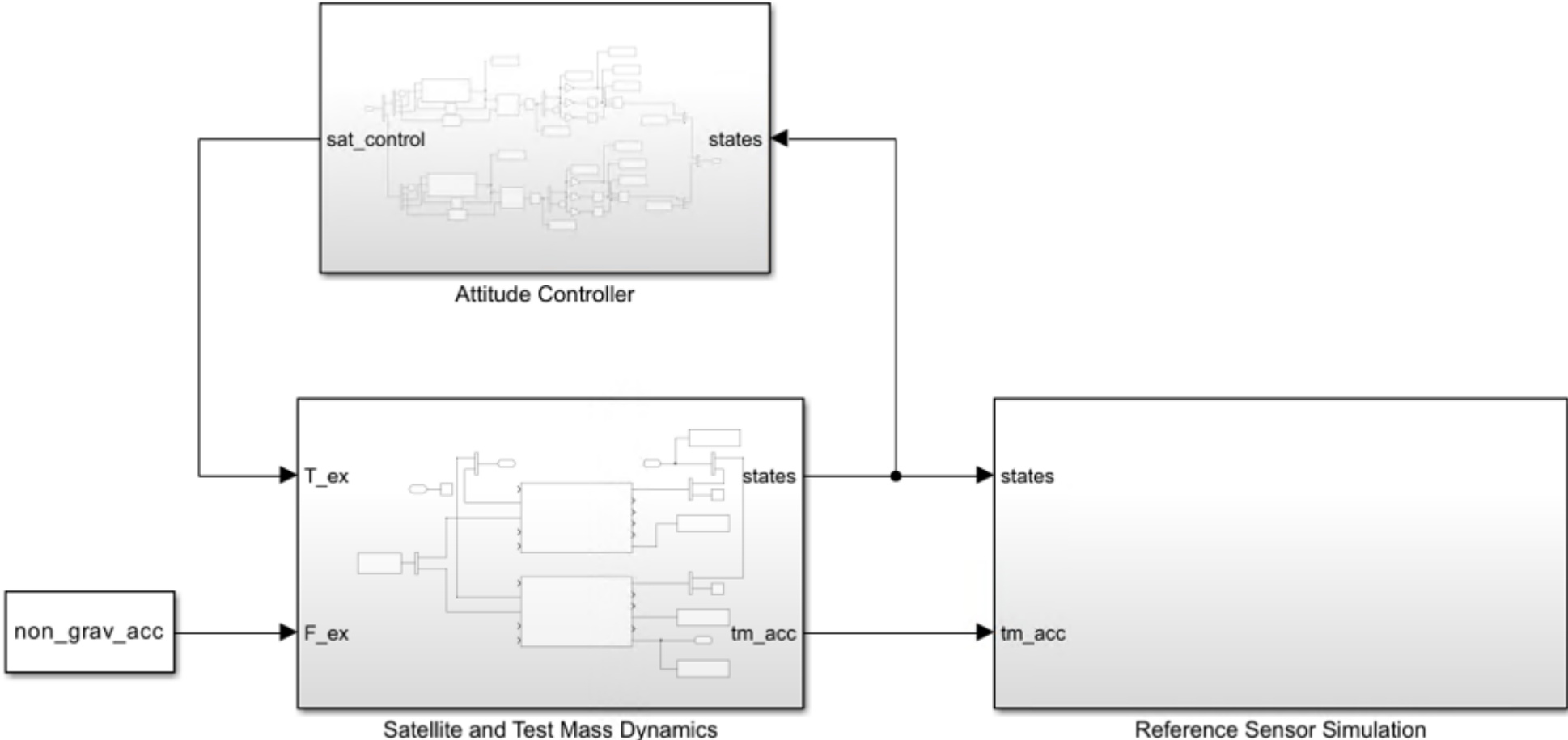
Simulation with VENQS[®] Software



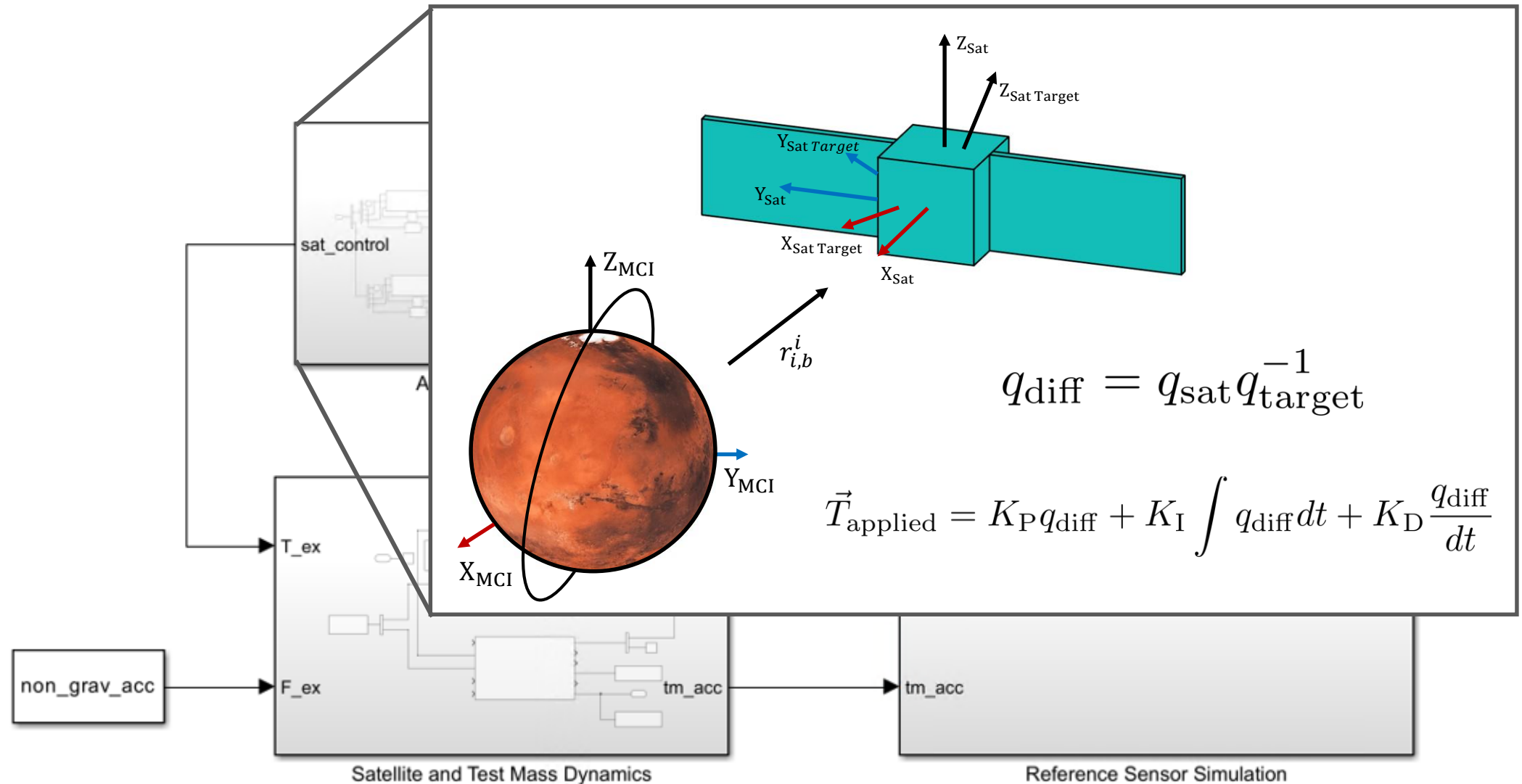
Simulation with VENQS® Software



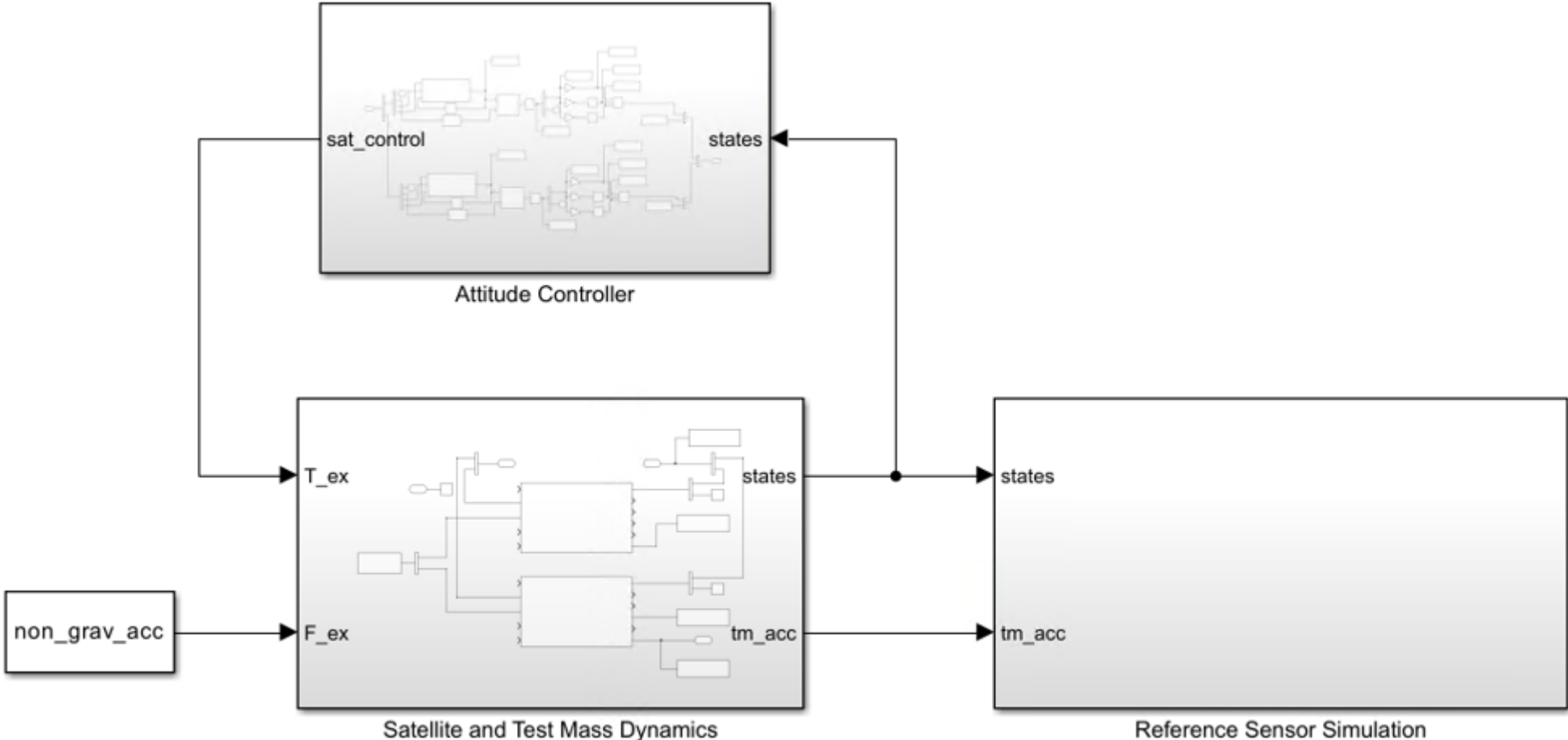
Simulation with VENQS[®] Software



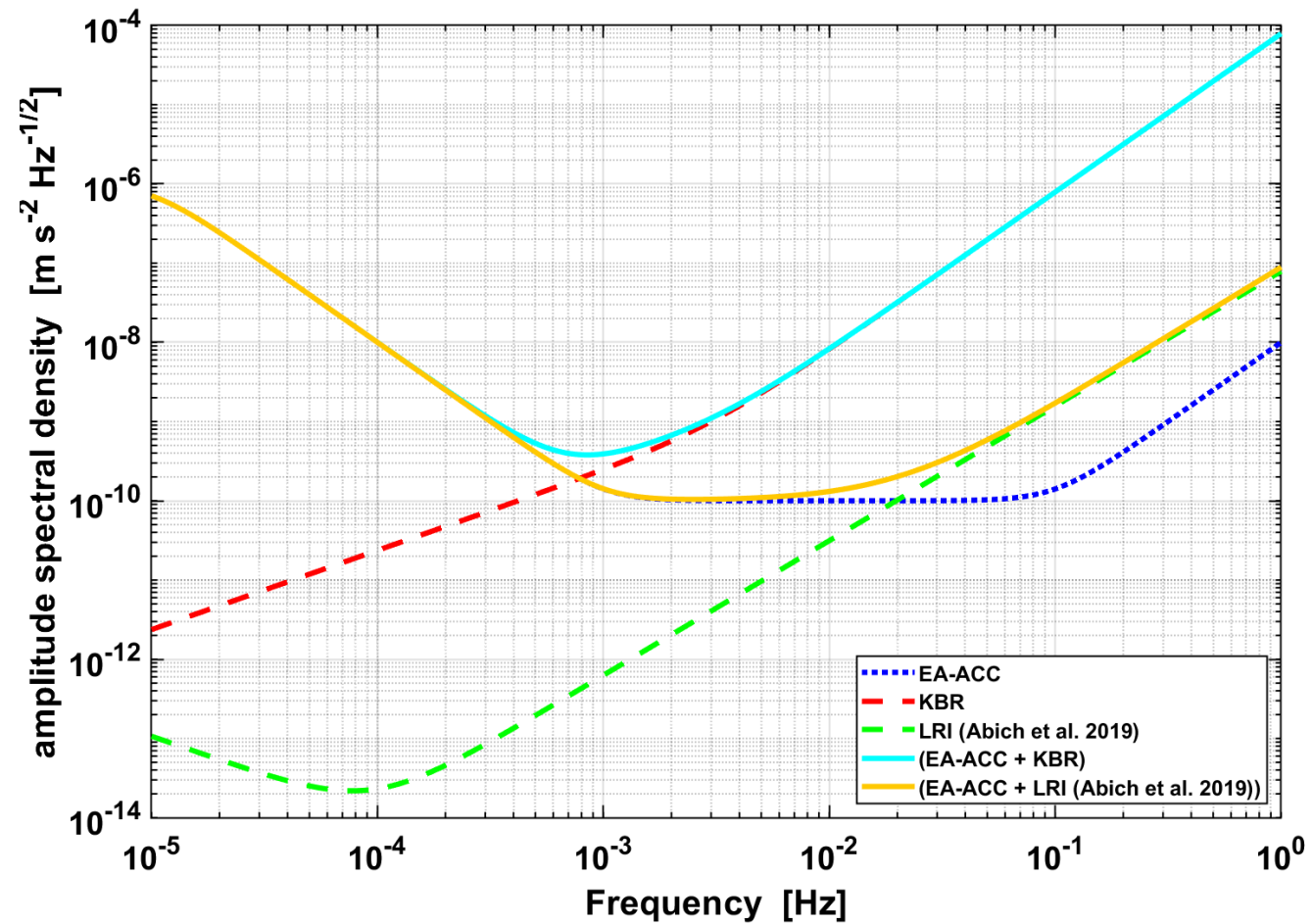
Simulation with VENQS® Software



Simulation with VENQS[®] Software



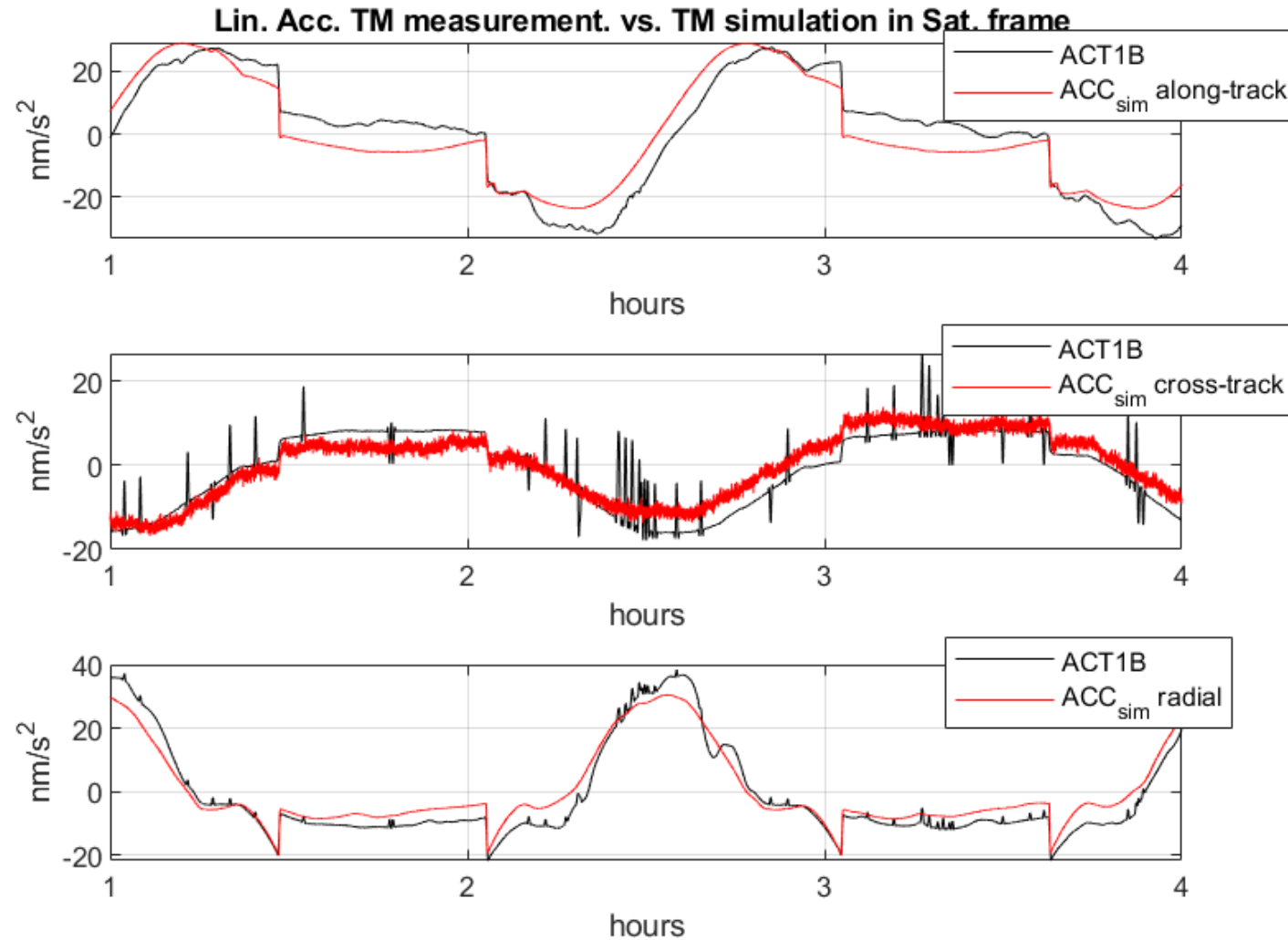
Noise models



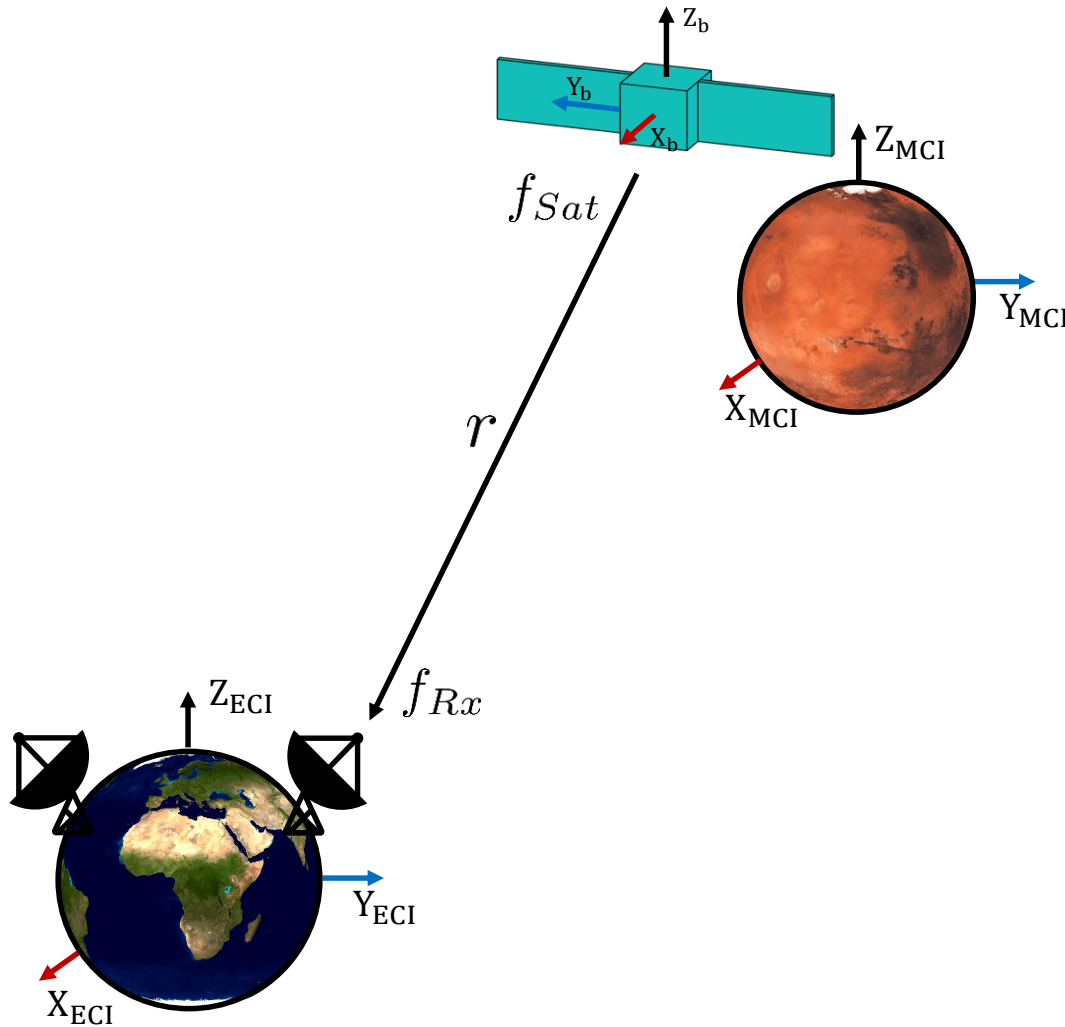
$$a_{err,along/radial} = \sqrt{1 + \frac{0.005}{f}} 10^{-10} \frac{m}{s^2 \sqrt{Hz}}$$

$$a_{err,cross} = \sqrt{1 + \frac{0.1}{f}} 10^{-9} \frac{m}{s^2 \sqrt{Hz}}$$

Accelerometer Data

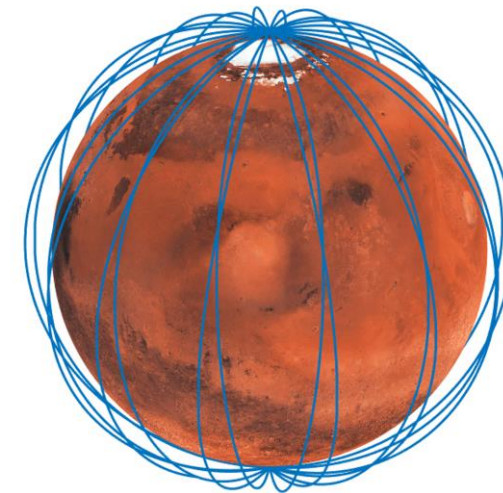


Doppler Ranging



$$f_{Rx} = f_{Sat} \left(1 - \frac{\dot{r}}{c} \right) + f_{err}$$

Ranging Error [4]:
 Bias 2m
 White Noise 60cm



[4] Thornton, Border (2000): Radiometric Tracking Techniques for Deep-Space Navigation

Conclusion



- We provide simulated data from ACC, LRI and Doppler Ranging for a satellite gravimetry mission at Mars
- Sensor models will be refined soon
- Modeling of atmospheric drag not yet included

- Goal: Close the simulation chain to obtain gravity field solution and to derive sensor and mission requirements

[1] NASA

[2] Ince, E. S. et. al. (2019): ICGEM – 15 years of successful collection and distribution of global gravitational models, associated services and future plans. - Earth System Science Data, 11, pp. 647-674,DOI:

<http://doi.org/10.5194/essd-11-647-2019>

[3] Abich et. al. (2019), In-Orbit Performance of the GRACE Follow-on Laser Ranging Interferometer

[4] Thornton, C.L., Border, J.S. (2000): Radiometric Tracking Techniques for Deep-Space Navigation