

Ground track series

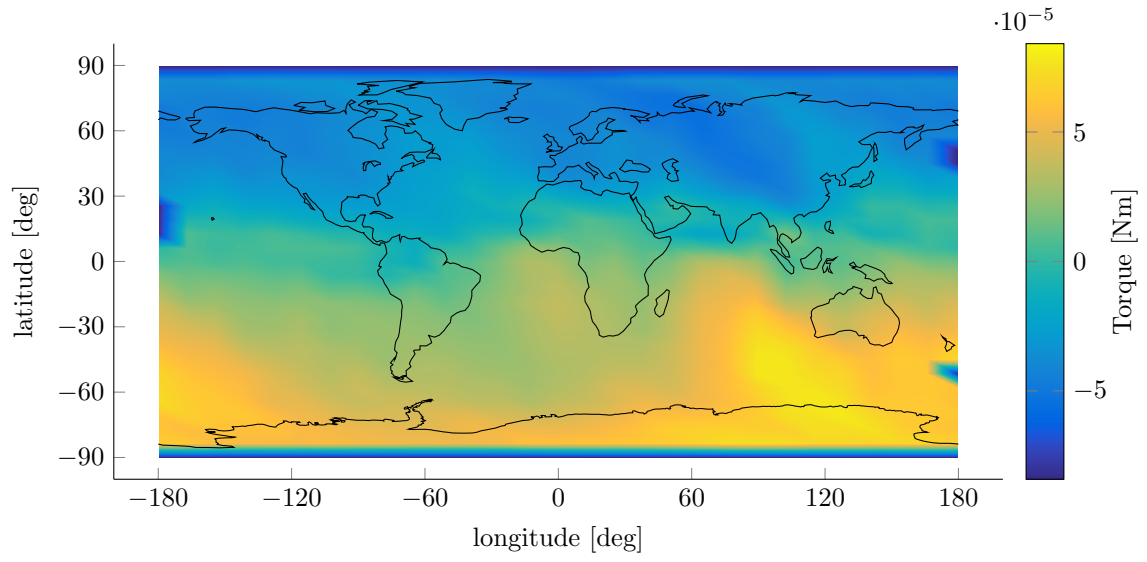
GOCE Aerodynamic Torque Modeling

T. Visser, E.N. Doornbos, C.C. de Visser, P.N.A.M. Visser

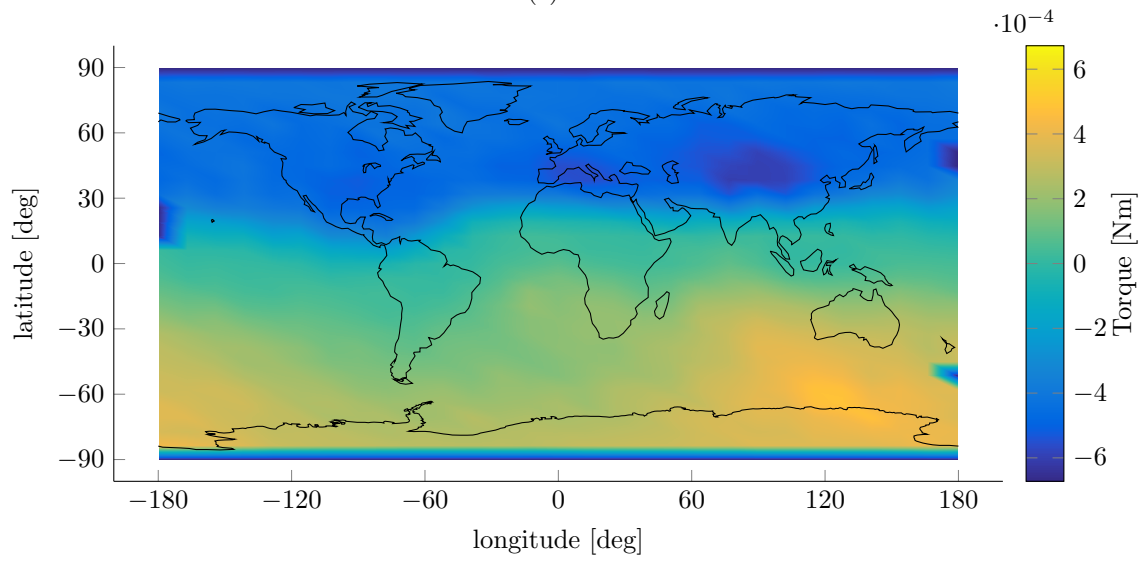
Faculty of Aerospace Engineering, Delft University of Technology, Delft, The Netherlands

B. Fritsche

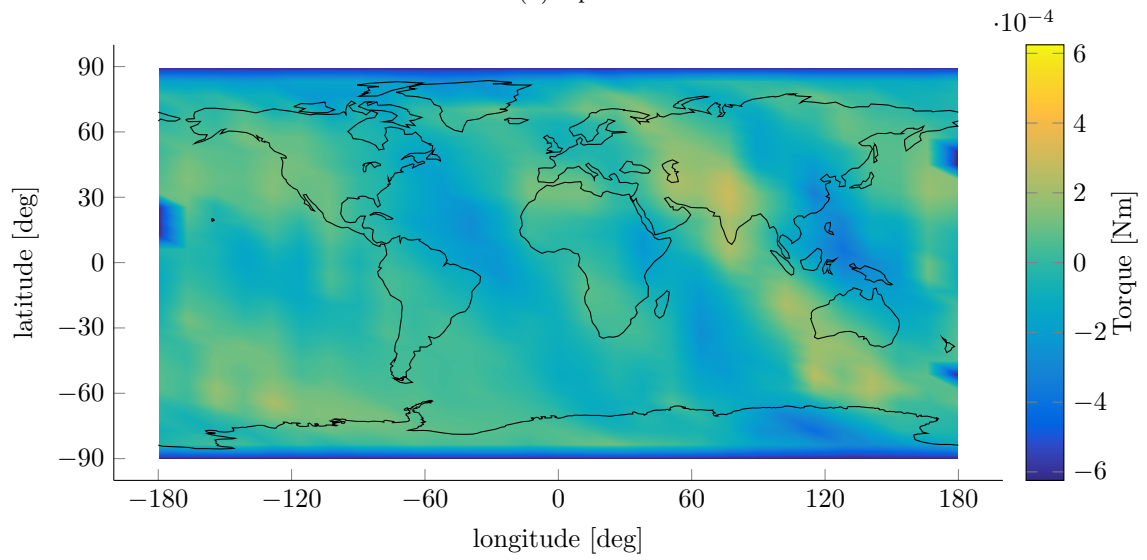
Hyperschall Technologie Göttingen GmbH, Katlenburg-Lindau, Germany



(a) \bar{T}_{roll}

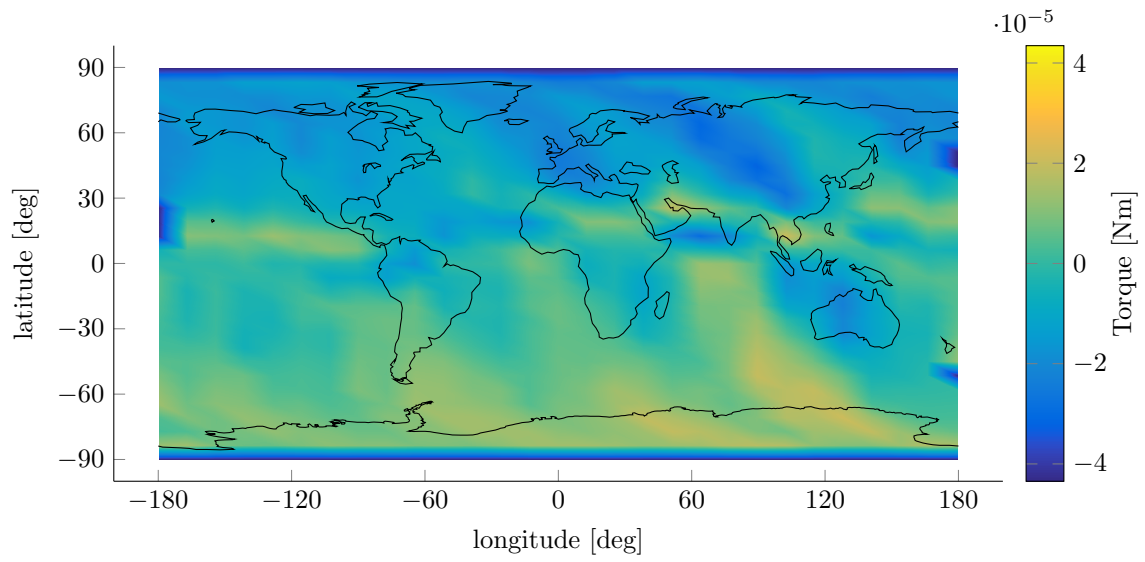


(b) \bar{T}_{pitch}

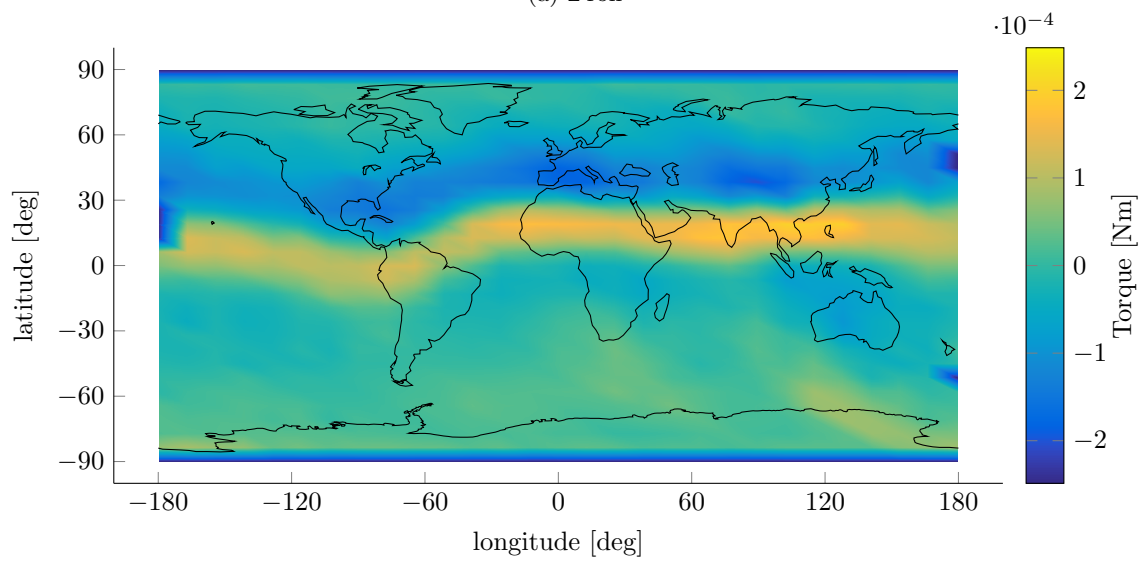


(c) \bar{T}_{yaw}

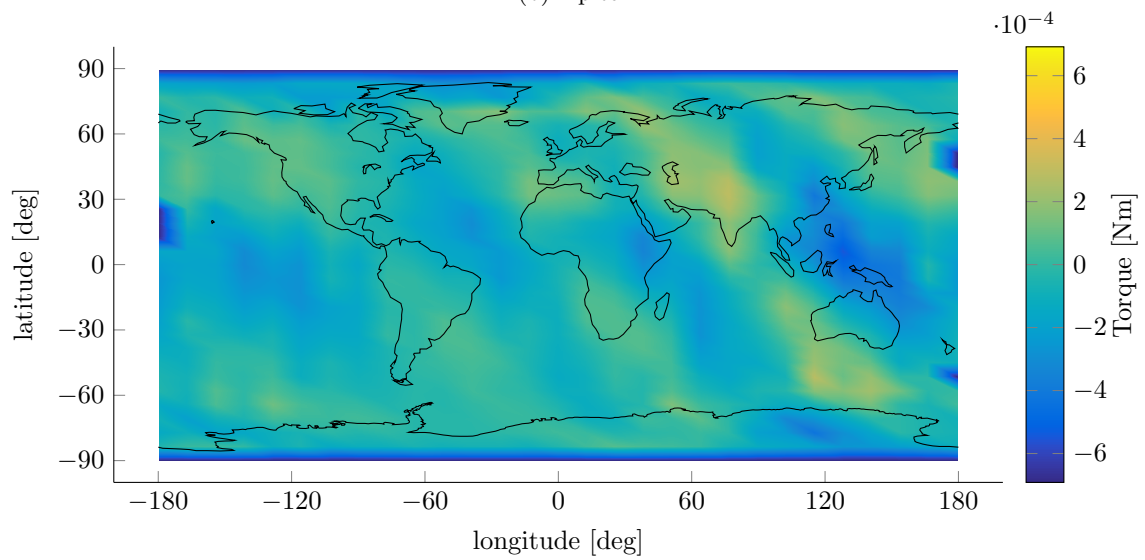
Figure 1: Total modeled torque \bar{T} projected onto the Earth's surface, ascending only, in October 2013.



(a) T_{roll}

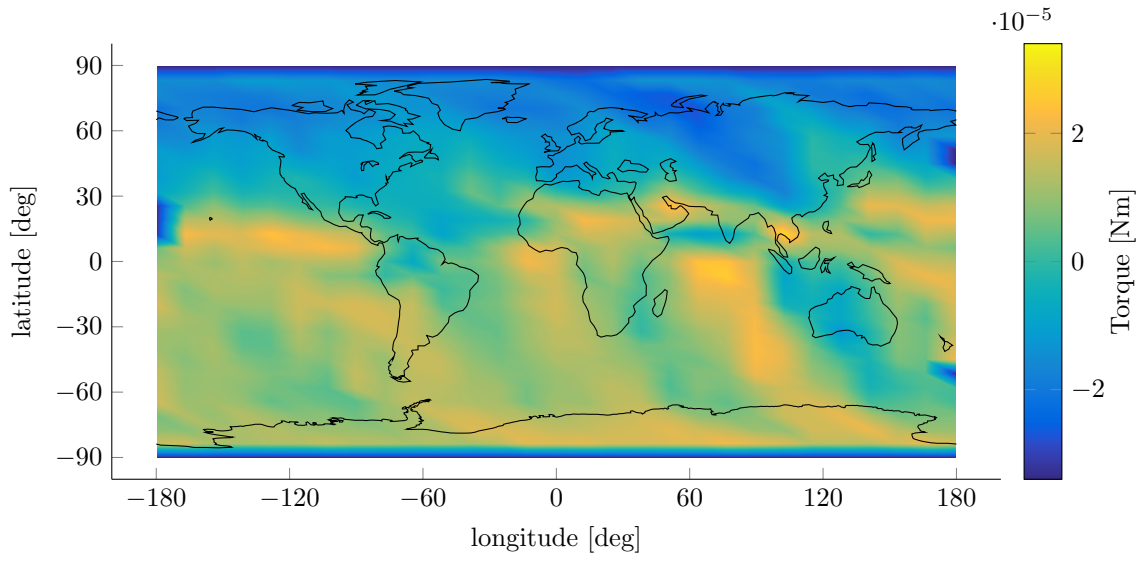


(b) T_{pitch}

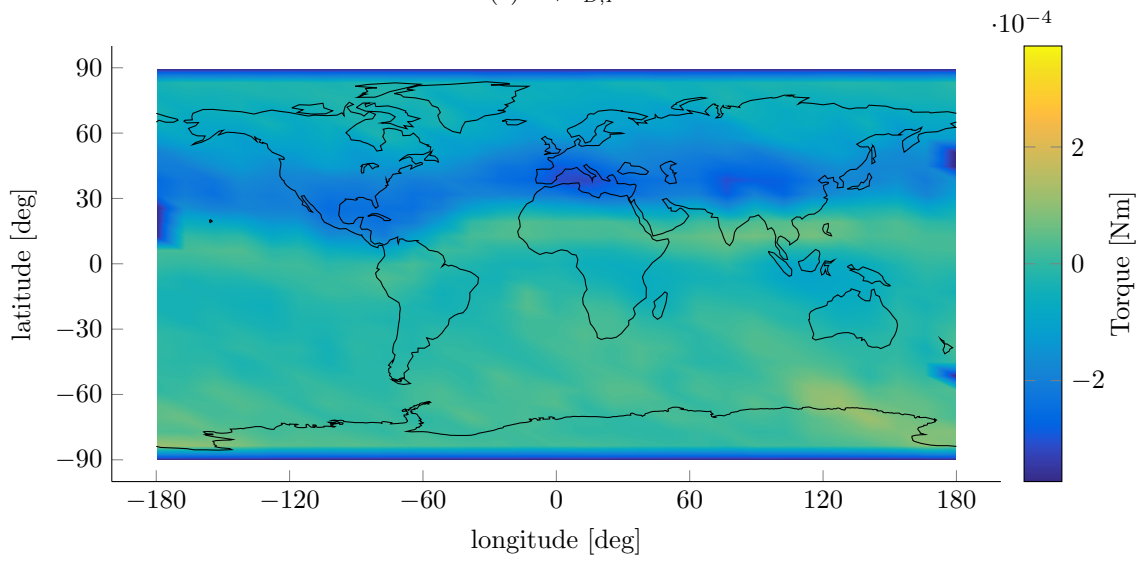


(c) T_{yaw}

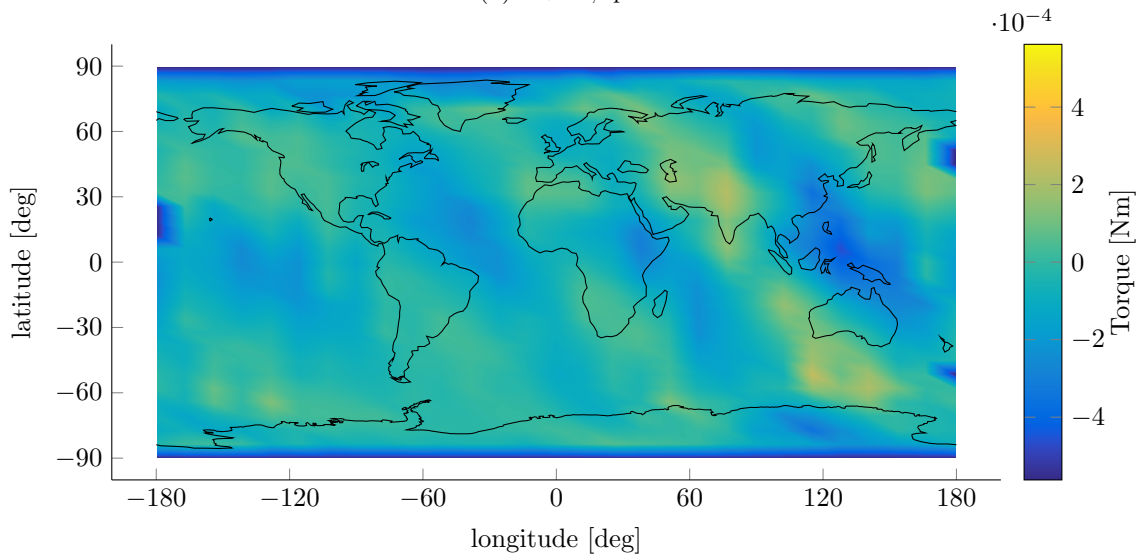
Figure 2: Measured torque \mathbf{T} projected onto the Earth's surface, ascending only, in October 2013.



(a) $\bar{\mathbf{T}} + \hat{\mathbf{T}}_{D,Proll}$

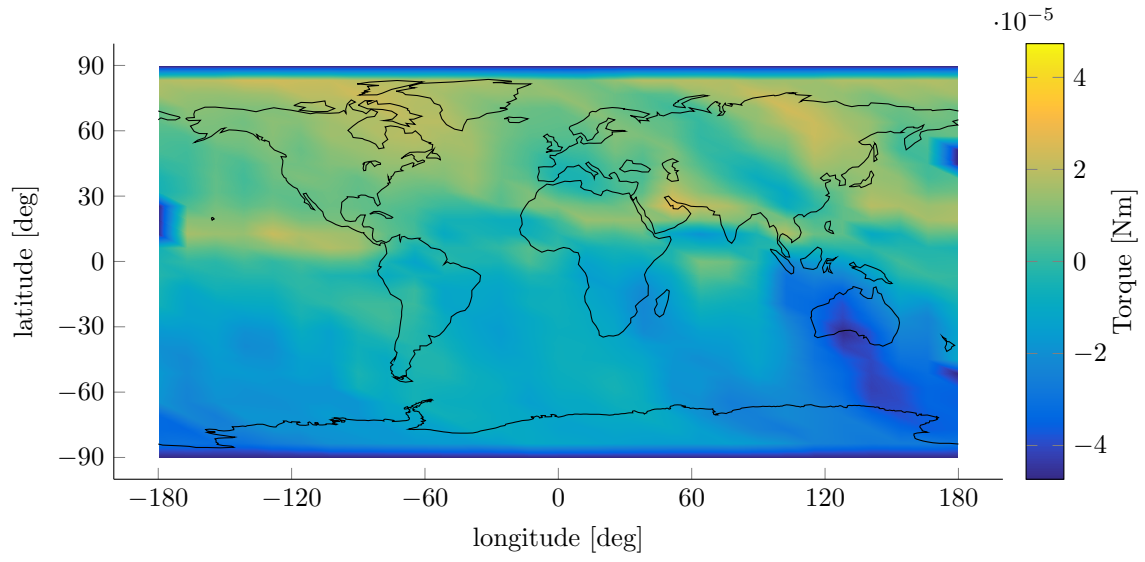


(b) $\bar{\mathbf{T}} + \hat{\mathbf{T}}_{D,Ppitch}$

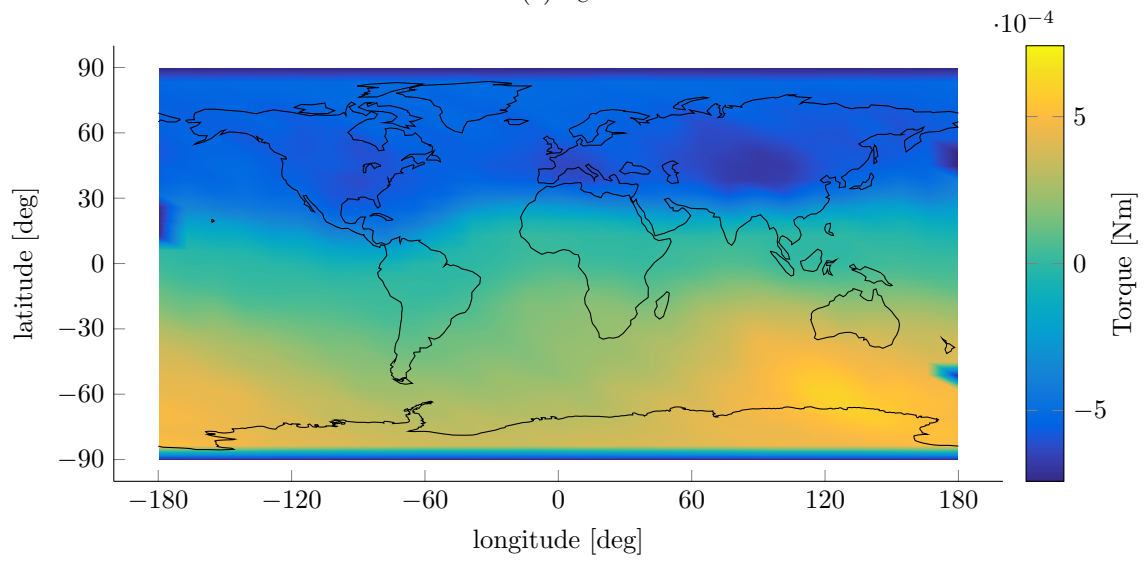


(c) $\bar{\mathbf{T}} + \hat{\mathbf{T}}_{D,Pyaw}$

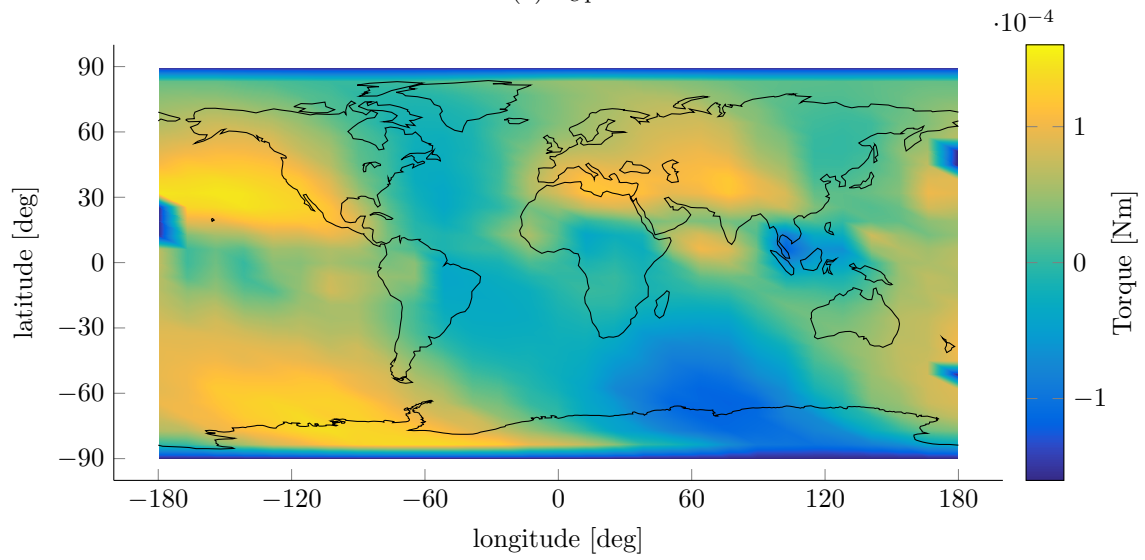
Figure 3: Total modeled torque $\bar{\mathbf{T}}$, and fitted payload dipole torque $\hat{\mathbf{T}}_{D,P}$ projected onto the Earth's surface, ascending only, in October 2013.



(a) \bar{T}_{Croll}

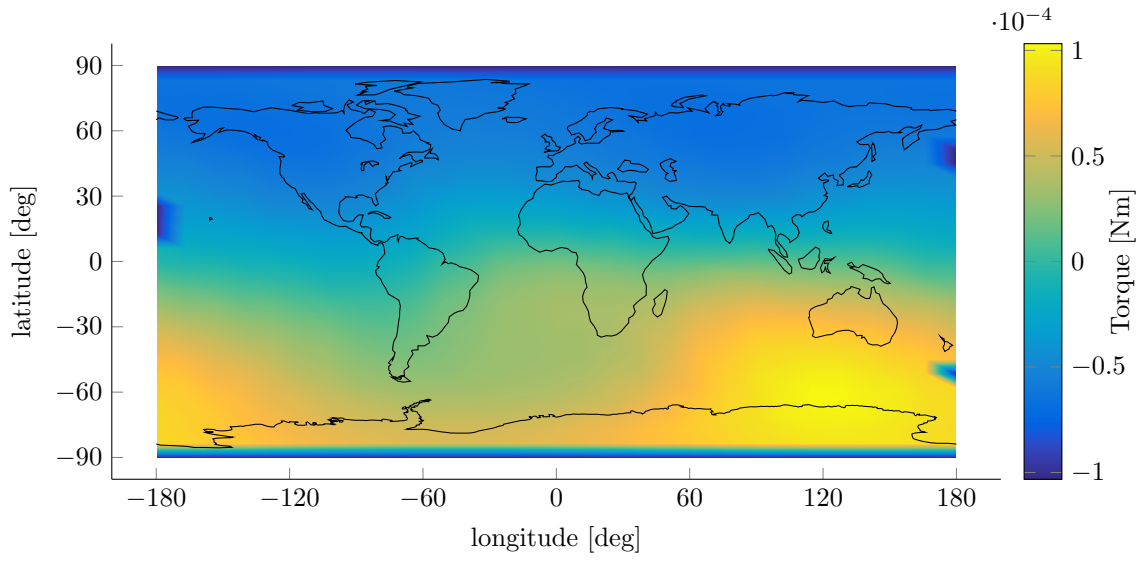


(b) \bar{T}_{Cpitch}

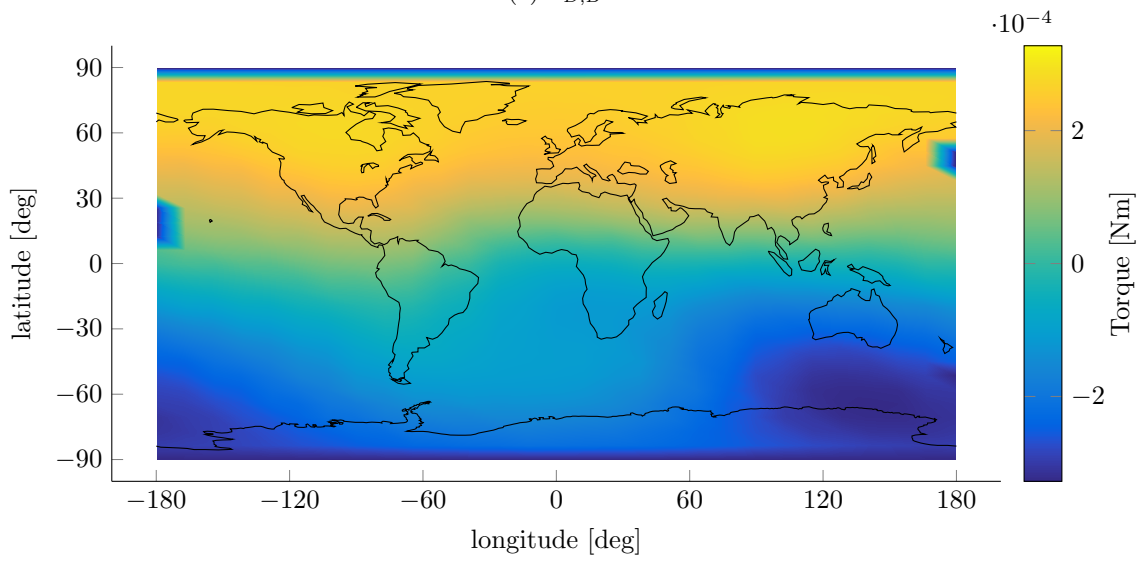


(c) \bar{T}_{Cyaw}

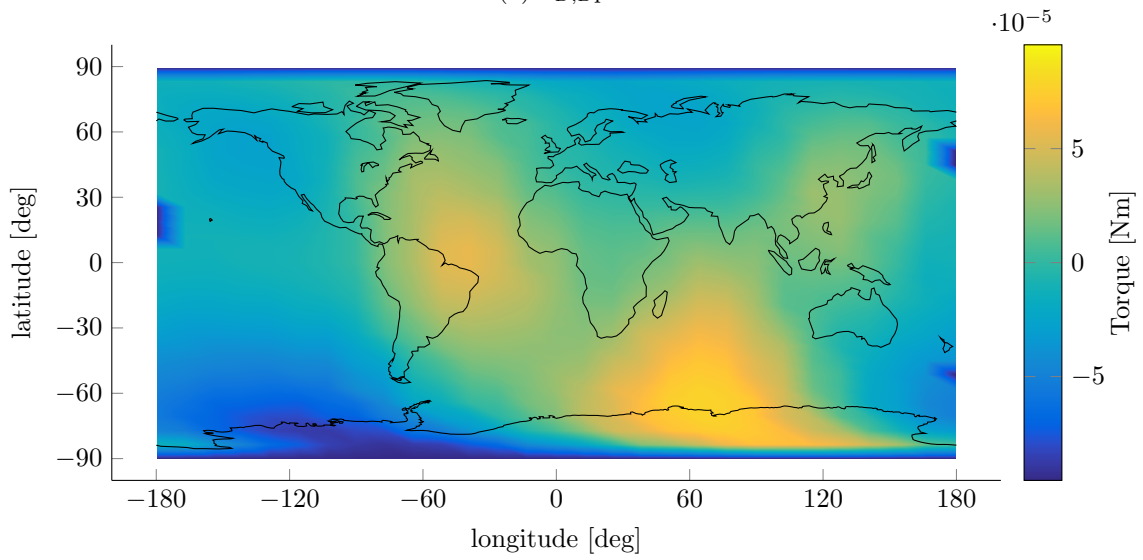
Figure 4: Magnetic control torque \bar{T}_C projected onto the Earth's surface, ascending only, in October 2013.



(a) $\bar{\mathbf{T}}_{D,Broll}$

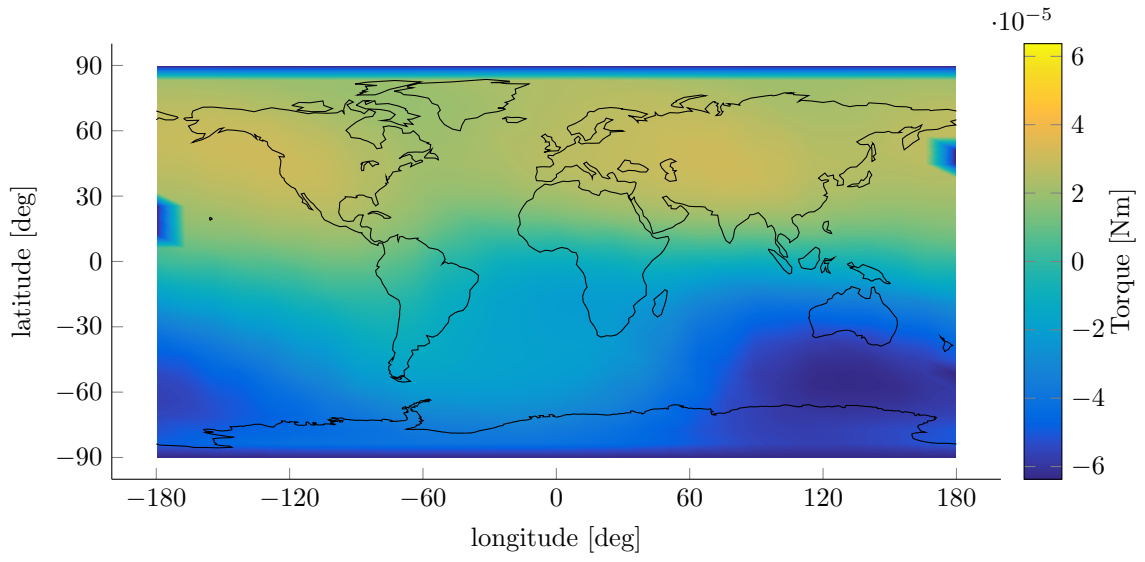


(b) $\bar{\mathbf{T}}_{D,Bpitch}$

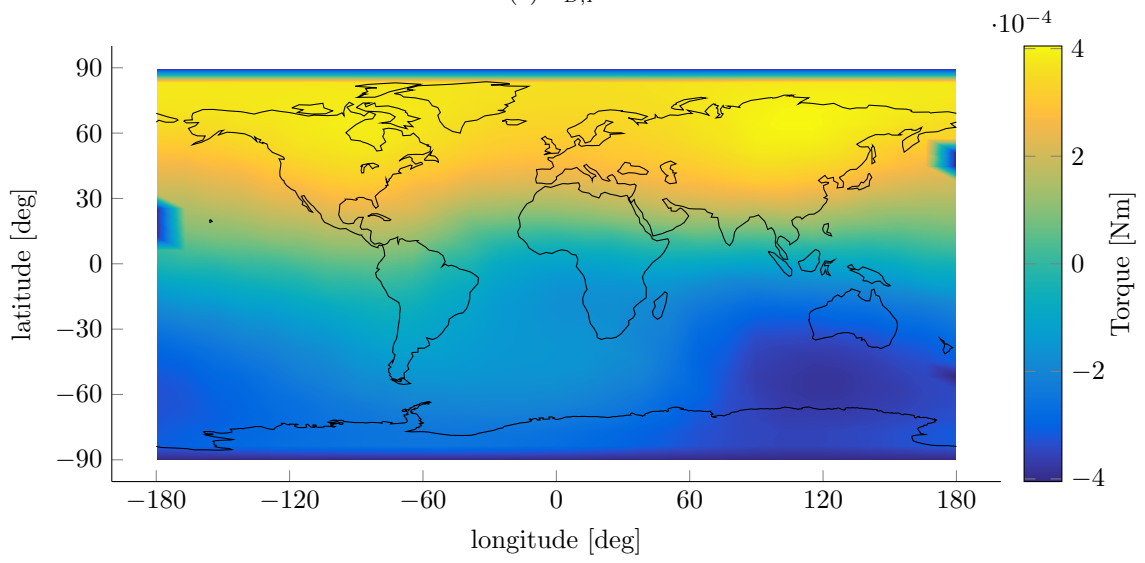


(c) $\bar{\mathbf{T}}_{D,Byaw}$

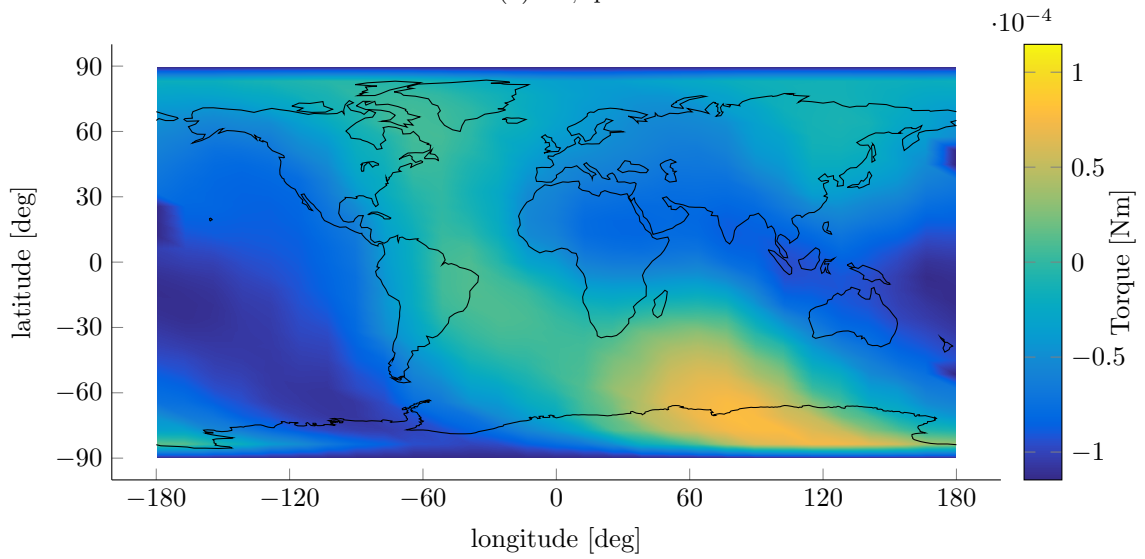
Figure 5: Residual bus dipole torque $\bar{\mathbf{T}}_{D,B}$ projected onto the Earth's surface, ascending only, in October 2013.



(a) $\hat{\mathbf{T}}_{D,P\text{roll}}$

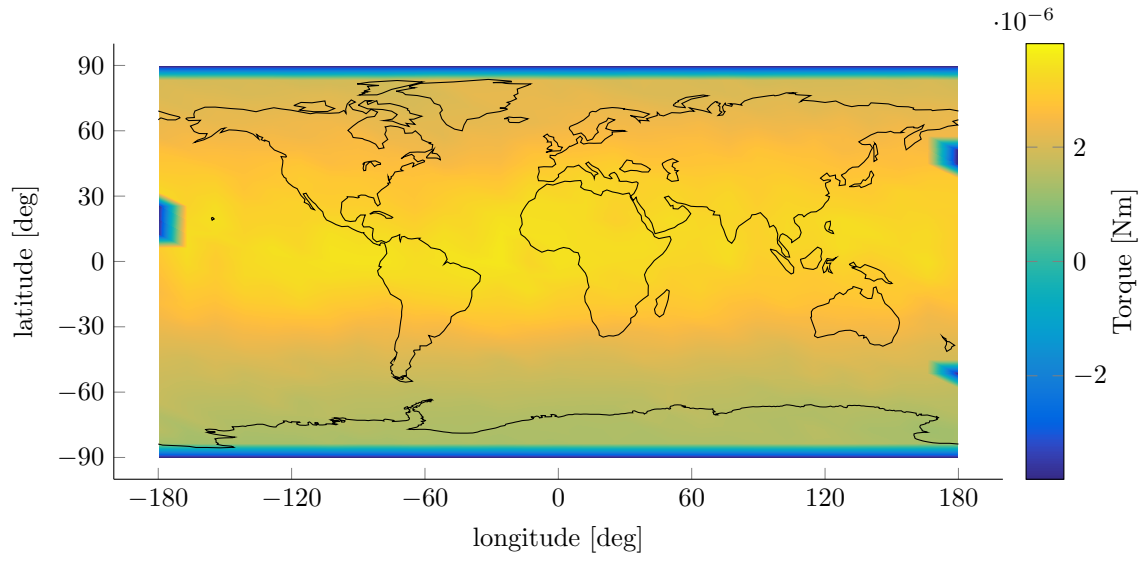


(b) $\hat{\mathbf{T}}_{D,P\text{pitch}}$

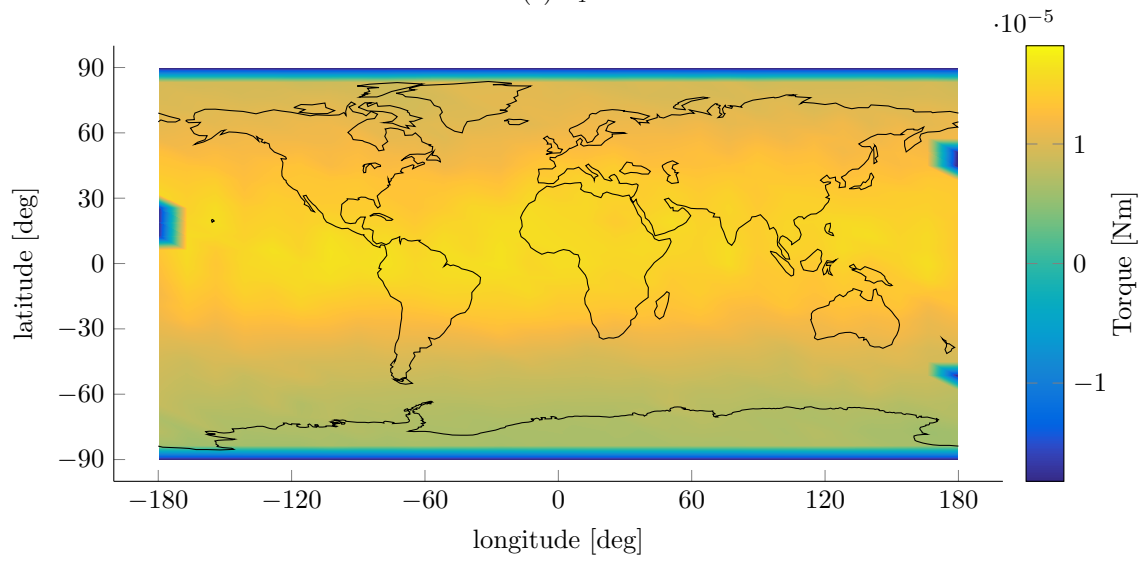


(c) $\hat{\mathbf{T}}_{D,P\text{yaw}}$

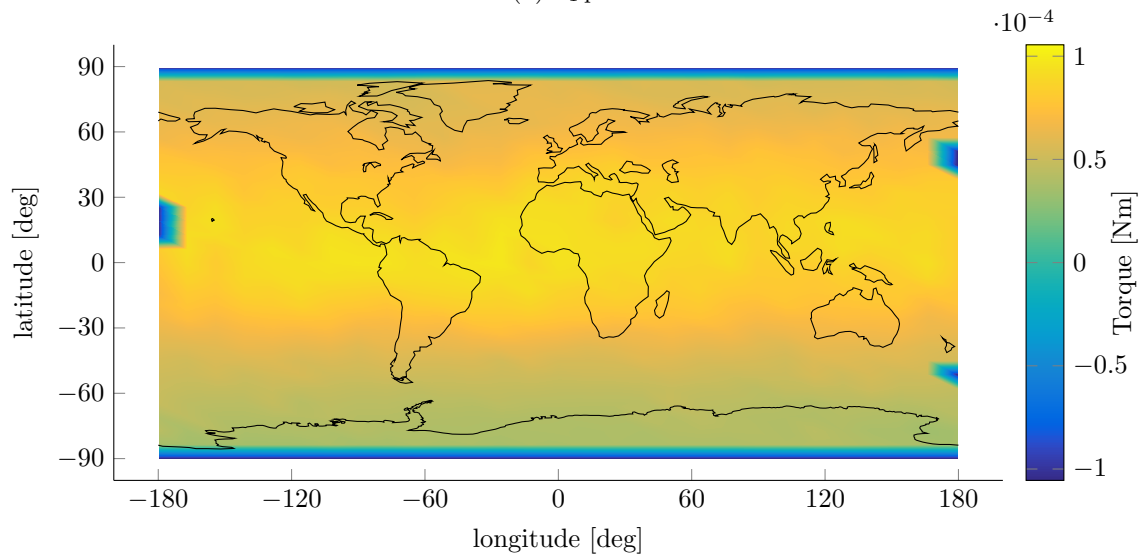
Figure 6: Fitted payload dipole torque $\hat{\mathbf{T}}_{D,P}$ projected onto the Earth's surface, ascending only, in October 2013.



(a) \bar{T}_{Troll}

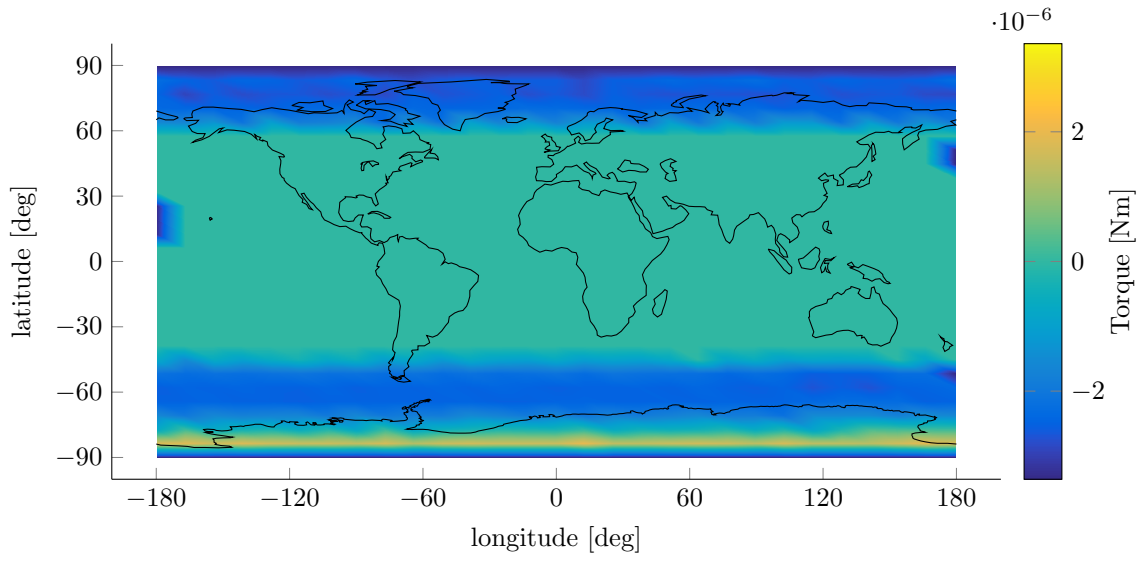


(b) \bar{T}_{Tpitch}

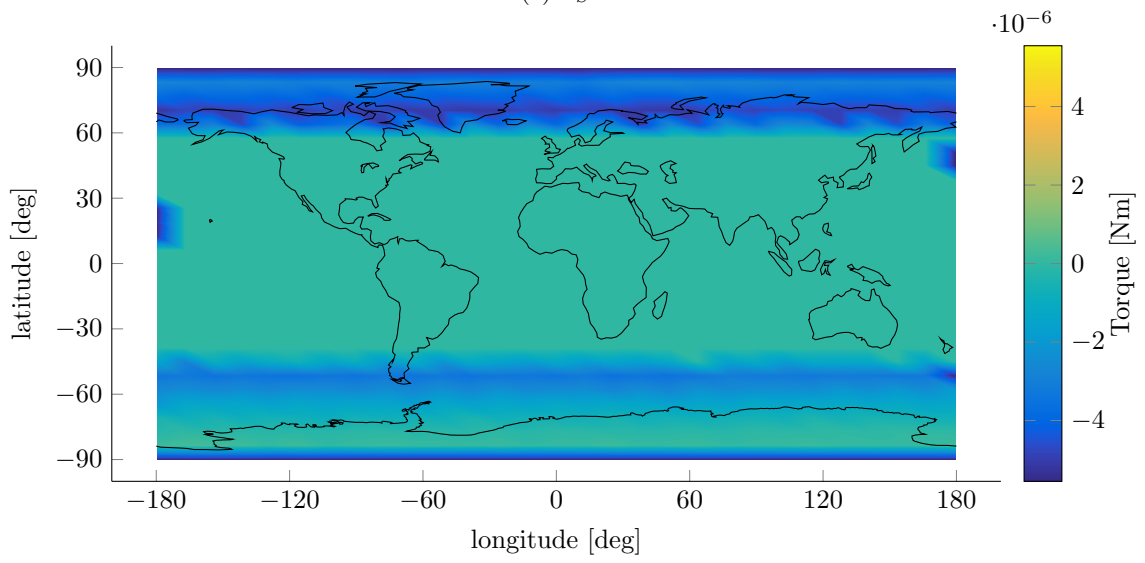


(c) \bar{T}_{Tyaw}

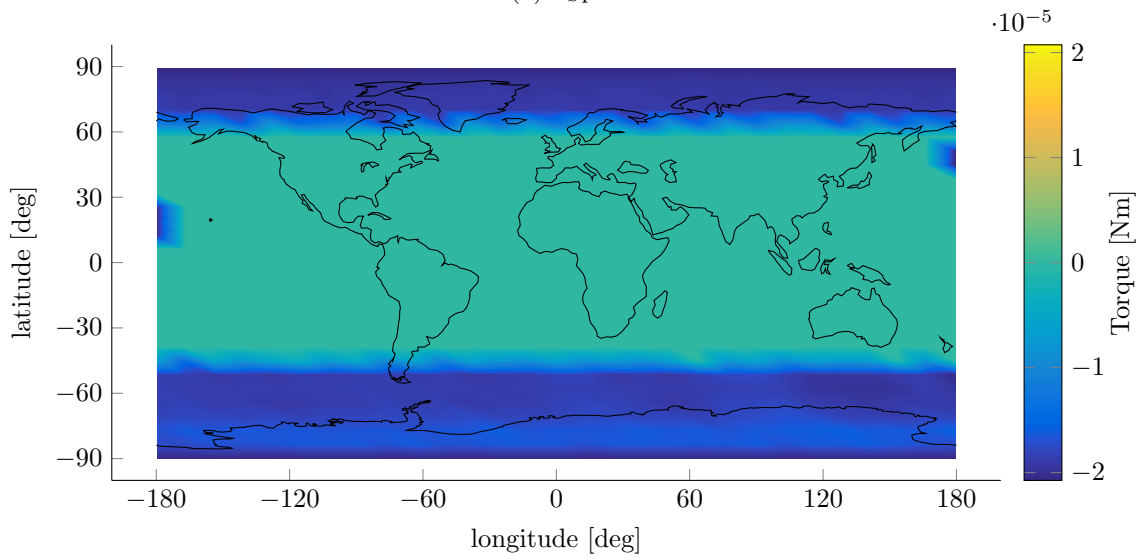
Figure 7: Thruster misalignment torque \bar{T}_T projected onto the Earth's surface, ascending only, in October 2013.



(a) $\bar{T}_{S\text{roll}}$

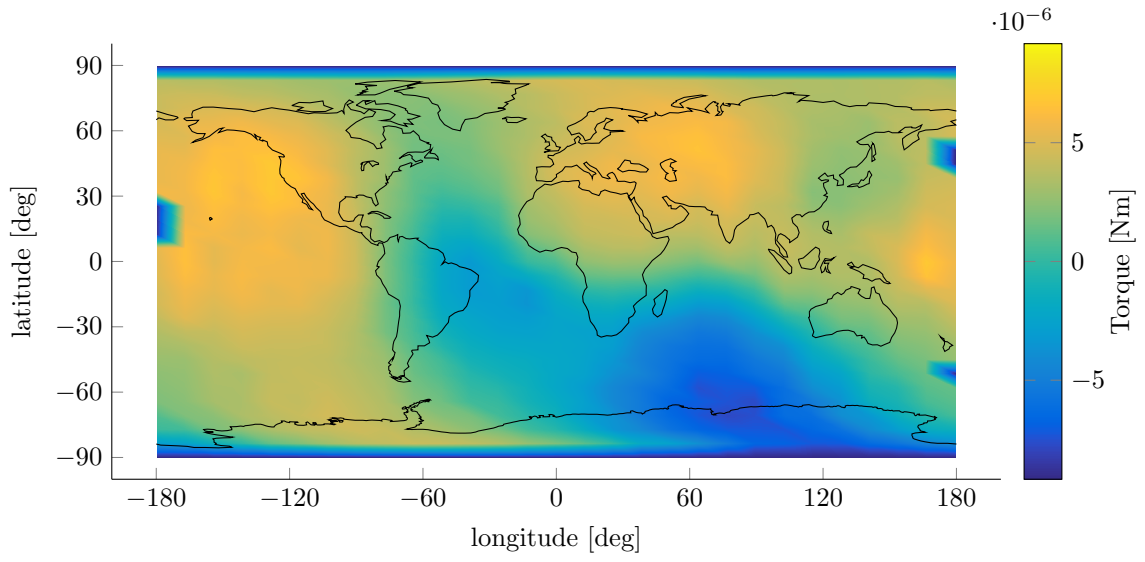


(b) $\bar{T}_{S\text{pitch}}$

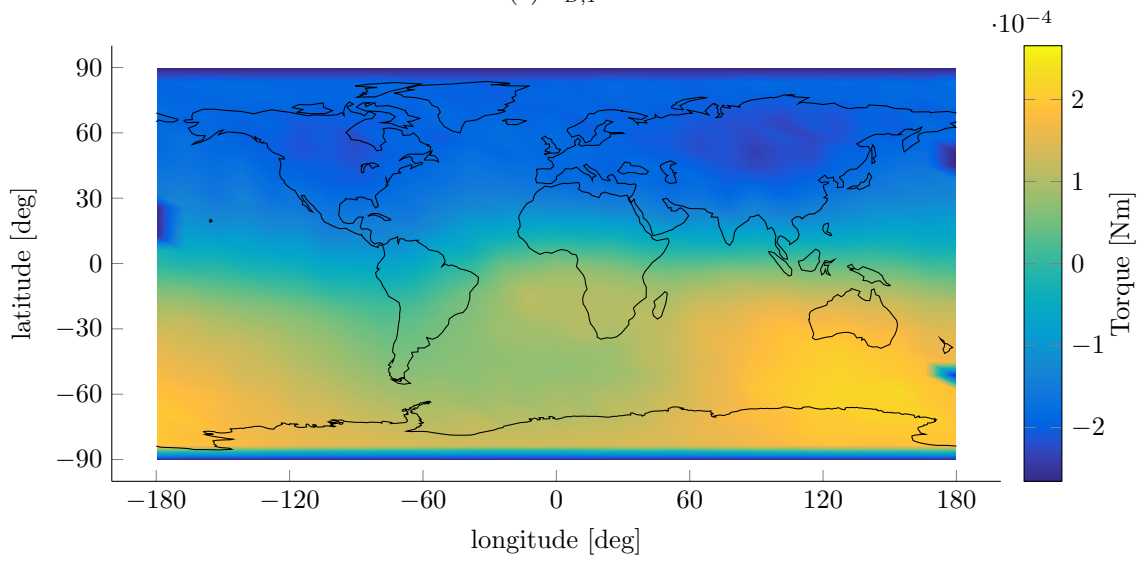


(c) $\bar{T}_{S\text{yaw}}$

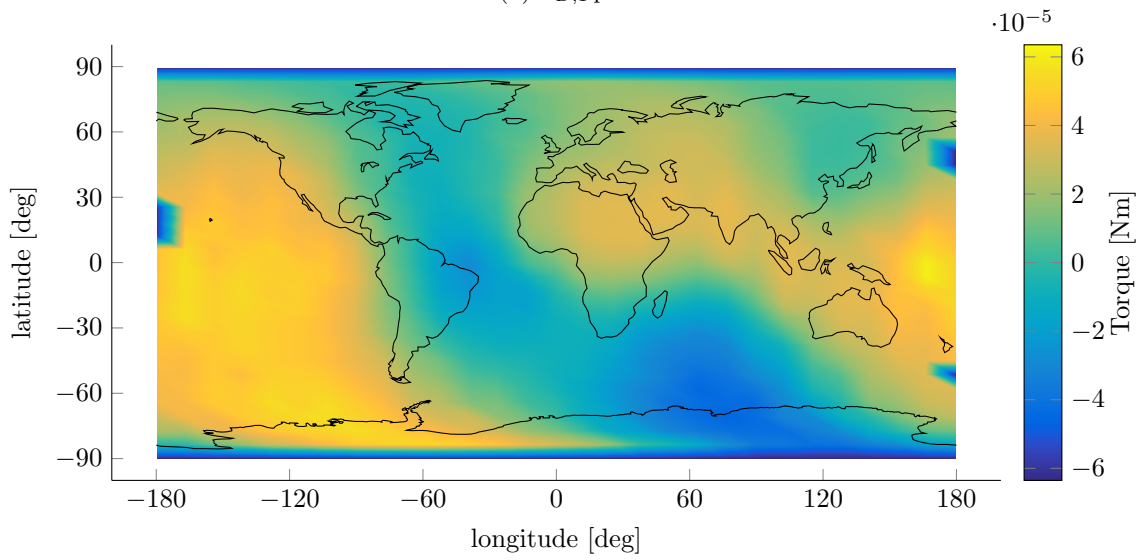
Figure 8: Solar radiation pressure torque \bar{T}_S projected onto the Earth's surface, ascending only, in October 2013.



(a) $\bar{\mathbf{T}}_{D,Troll}$

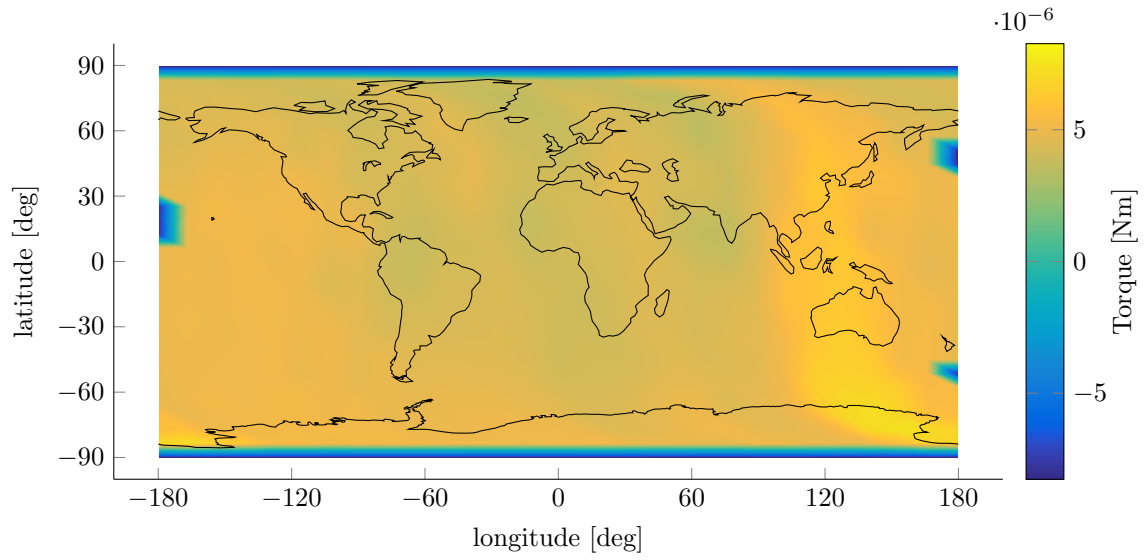


(b) $\bar{\mathbf{T}}_{D,Tpitch}$

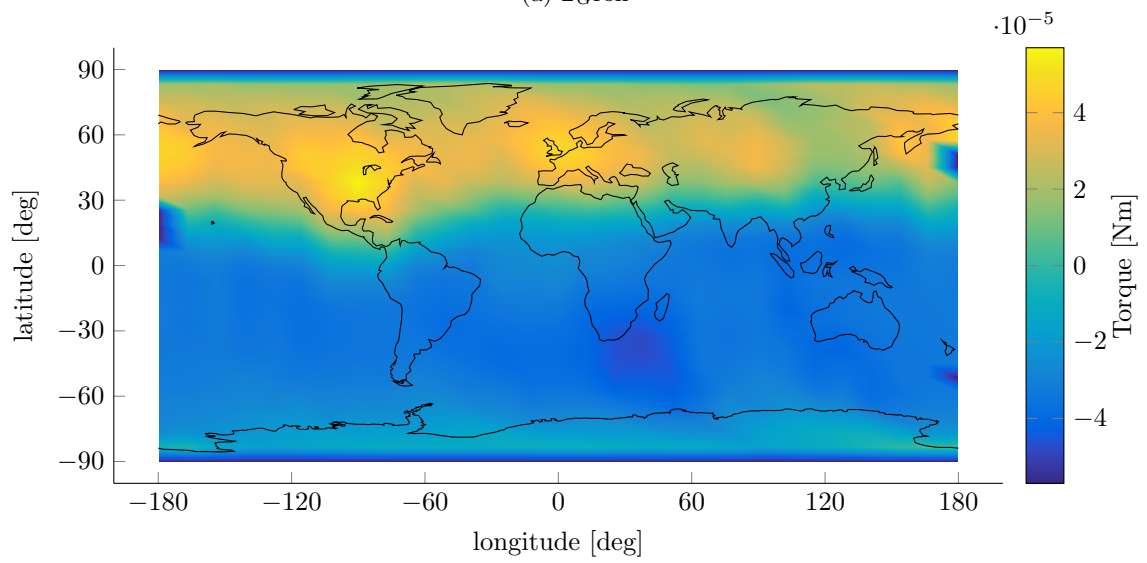


(c) $\bar{\mathbf{T}}_{D,Tyaw}$

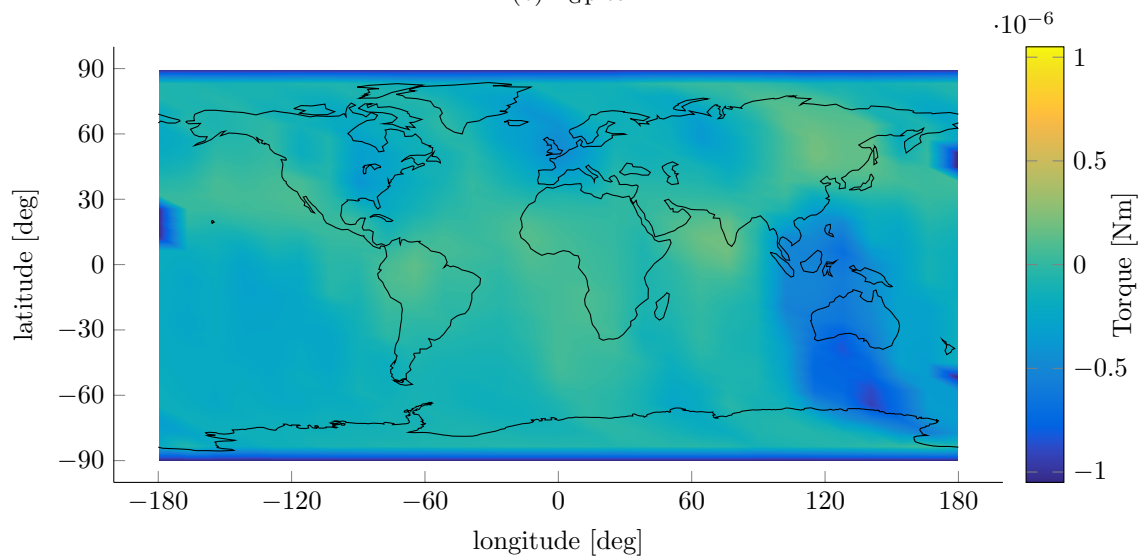
Figure 9: Thruster dipole torque $\bar{\mathbf{T}}_{D,T}$ projected onto the Earth's surface, ascending only, in October 2013.



(a) $\bar{\mathbf{T}}_{G\text{roll}}$

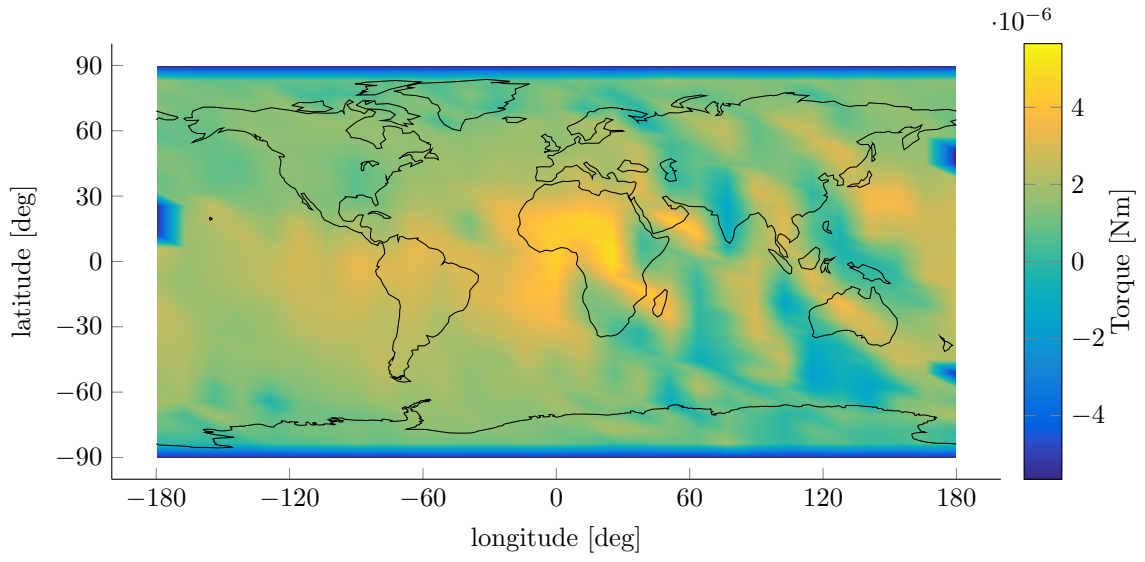


(b) $\bar{\mathbf{T}}_{G\text{pitch}}$

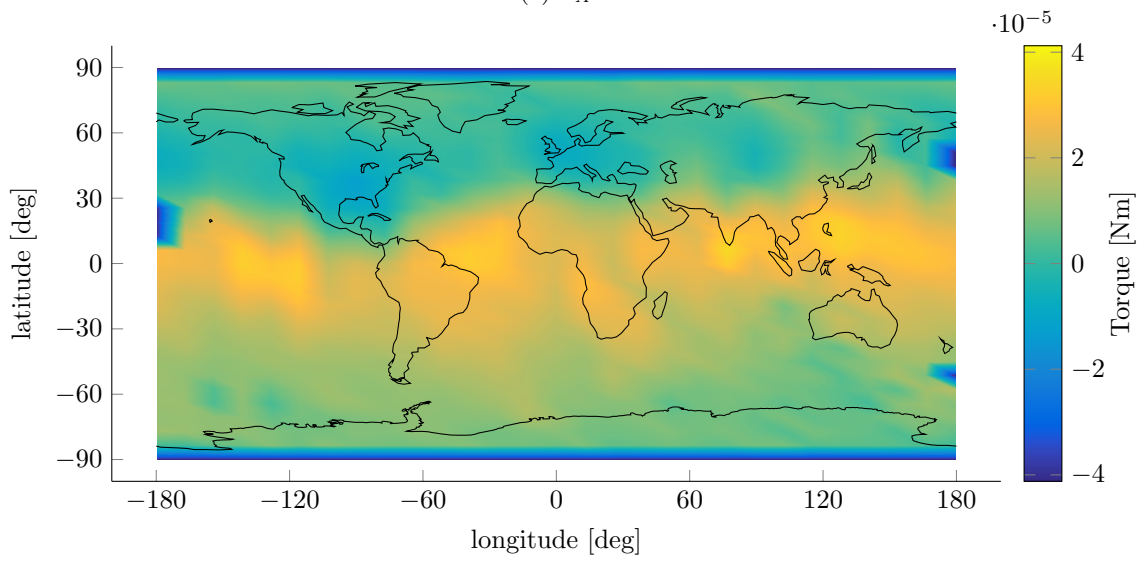


(c) $\bar{\mathbf{T}}_{G\text{yaw}}$

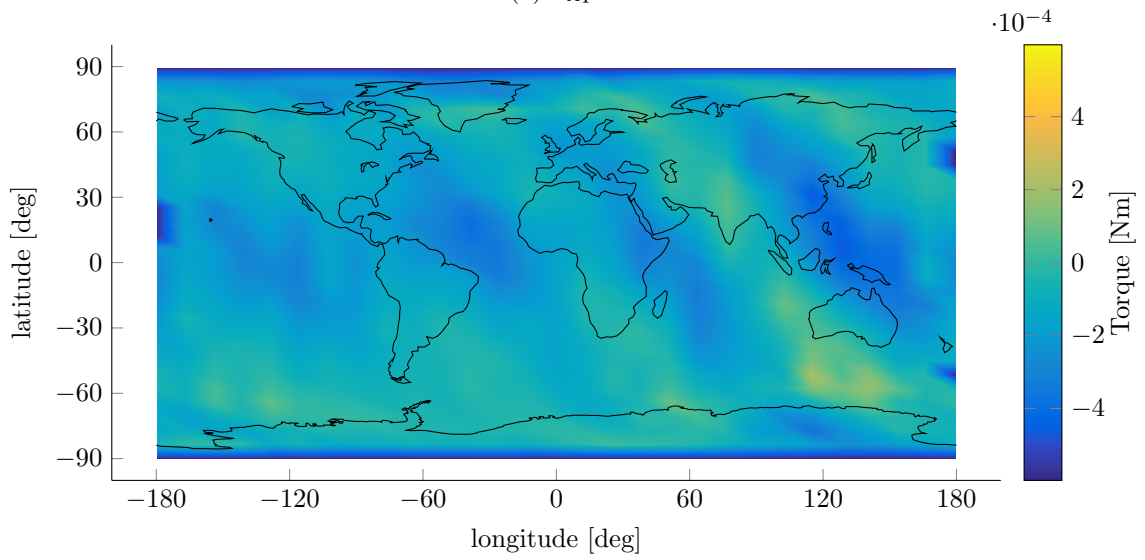
Figure 10: Gravity gradient torque $\bar{\mathbf{T}}_G$ projected onto the Earth's surface, ascending only, in October 2013.



(a) $\bar{\mathbf{T}}_{Aroll}$

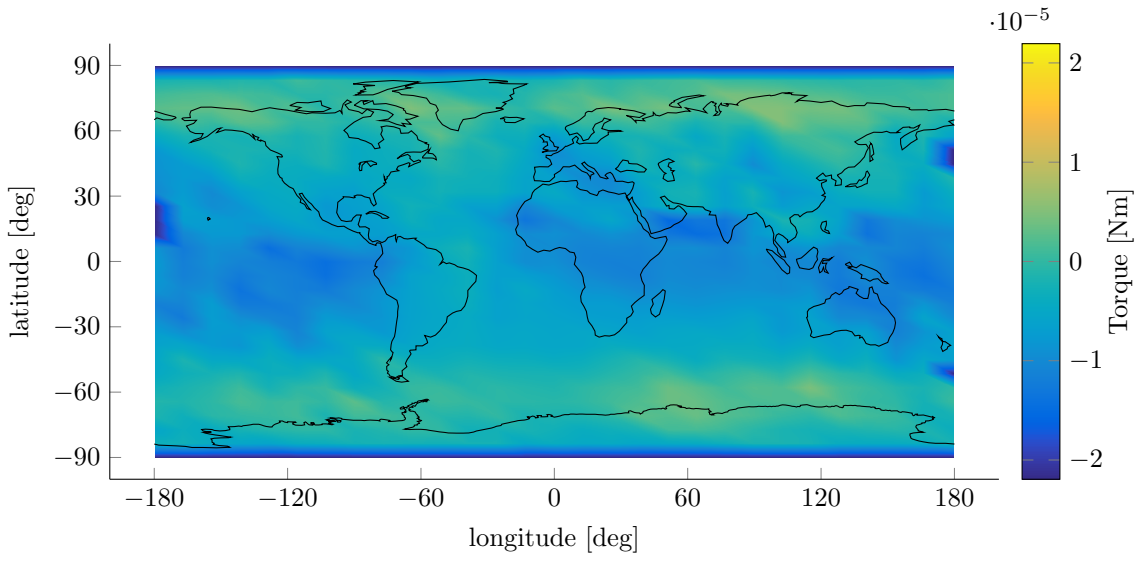


(b) $\bar{\mathbf{T}}_{Apitch}$

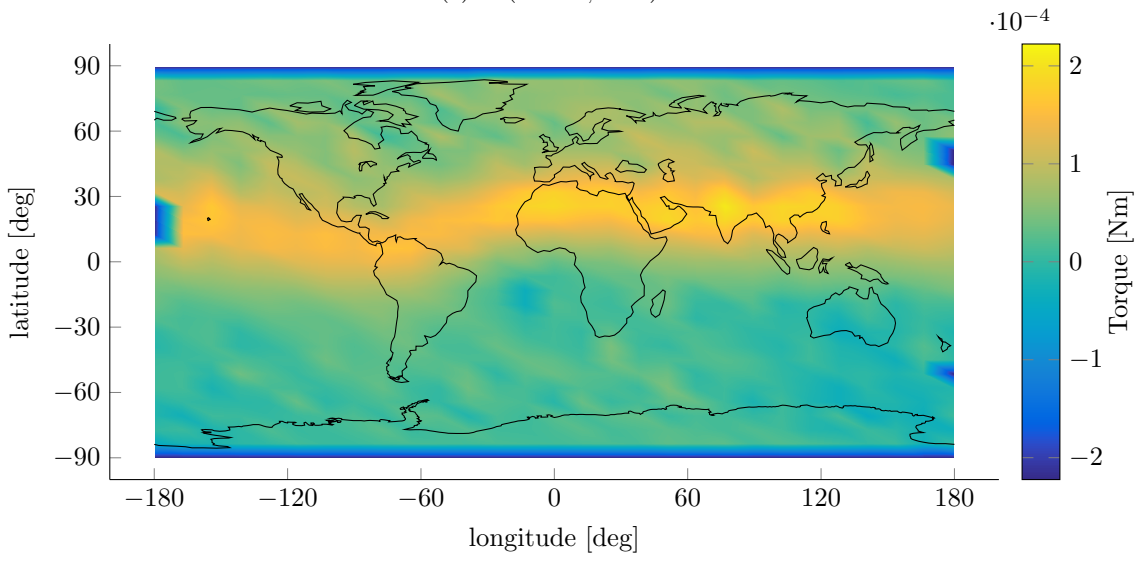


(c) $\bar{\mathbf{T}}_{Ayaw}$

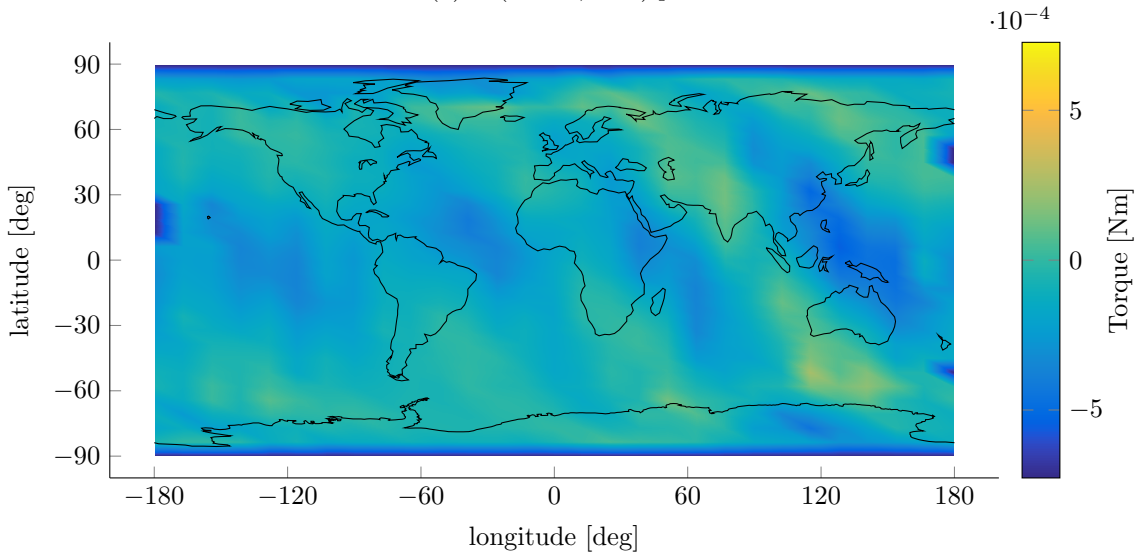
Figure 11: Aerodynamic torque $\bar{\mathbf{T}}_A$ projected onto the Earth's surface, ascending only, in October 2013.



(a) $\mathbf{T} - (\bar{\mathbf{T}} + \hat{\mathbf{T}}_{D,P} - \bar{\mathbf{T}}_A)$ roll



(b) $\mathbf{T} - (\bar{\mathbf{T}} + \hat{\mathbf{T}}_{D,P} - \bar{\mathbf{T}}_A)$ pitch



(c) $\mathbf{T} - (\bar{\mathbf{T}} + \hat{\mathbf{T}}_{D,P} - \bar{\mathbf{T}}_A)$ yaw

Figure 12: Measured torque \mathbf{T} , total modeled torque $\bar{\mathbf{T}}$, fitted payload dipole torque $\hat{\mathbf{T}}_{D,P}$, and aerodynamic torque $\bar{\mathbf{T}}_A$ projected onto the Earth's surface, ascending only, in October 2013.