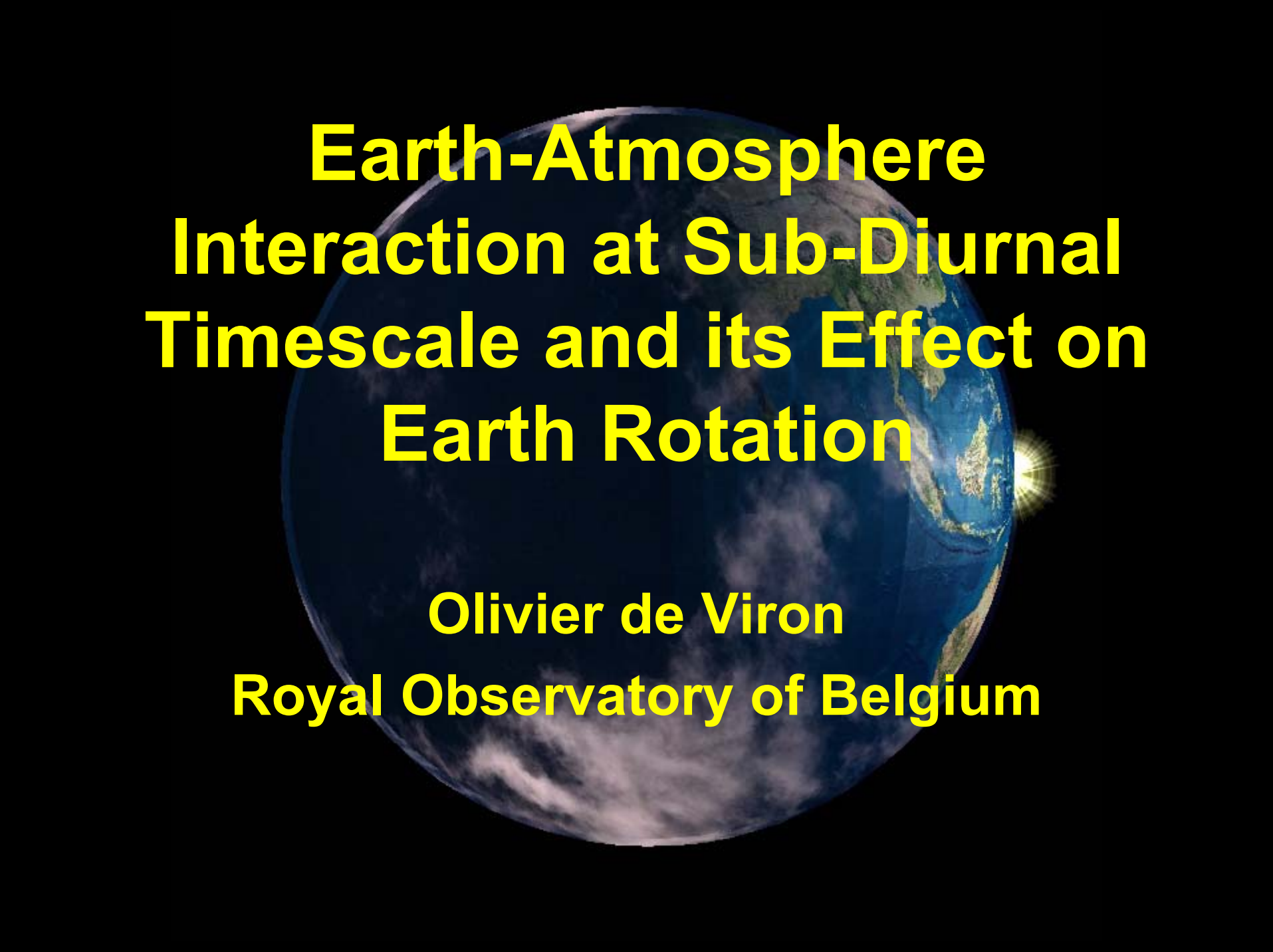
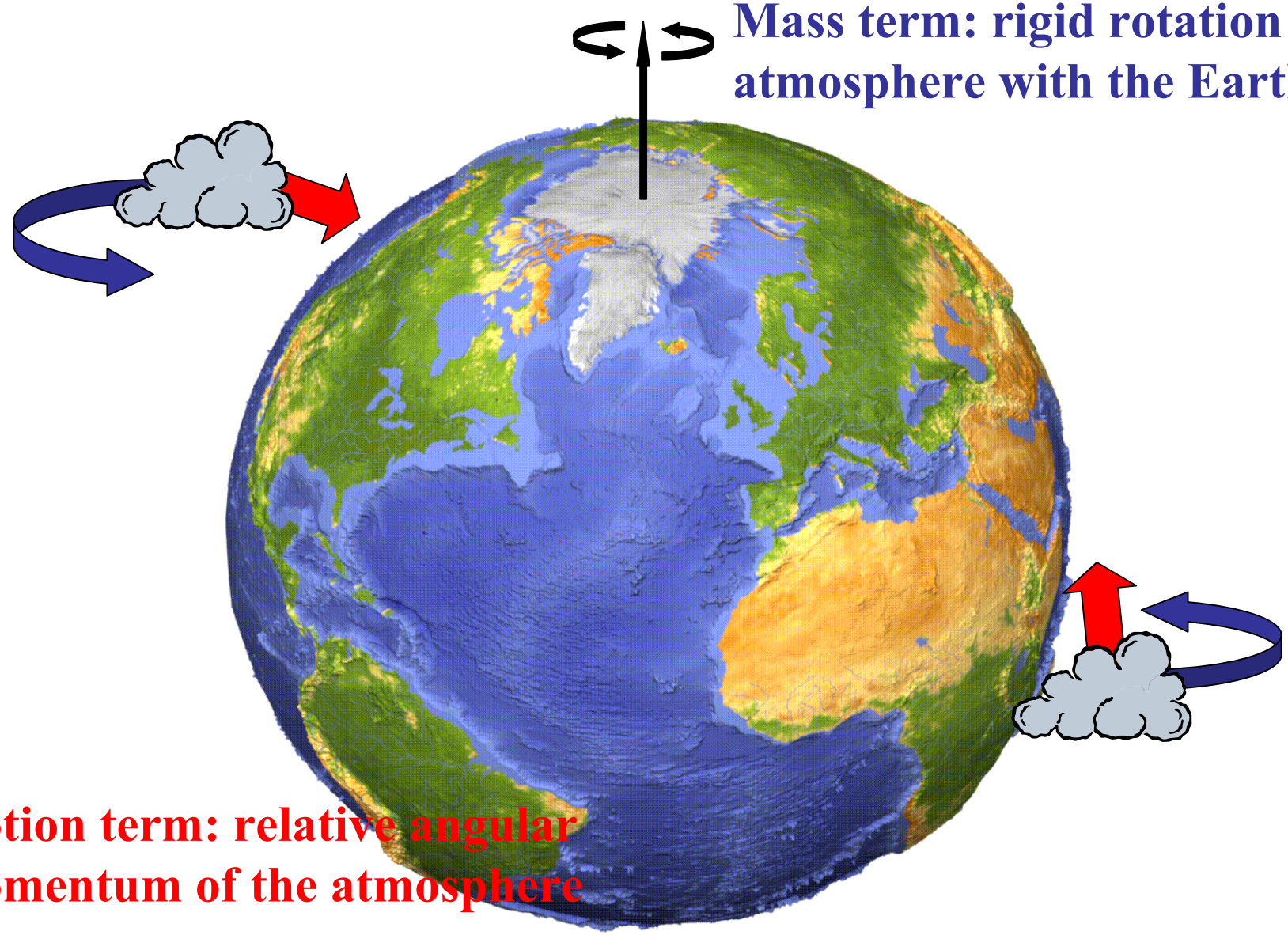


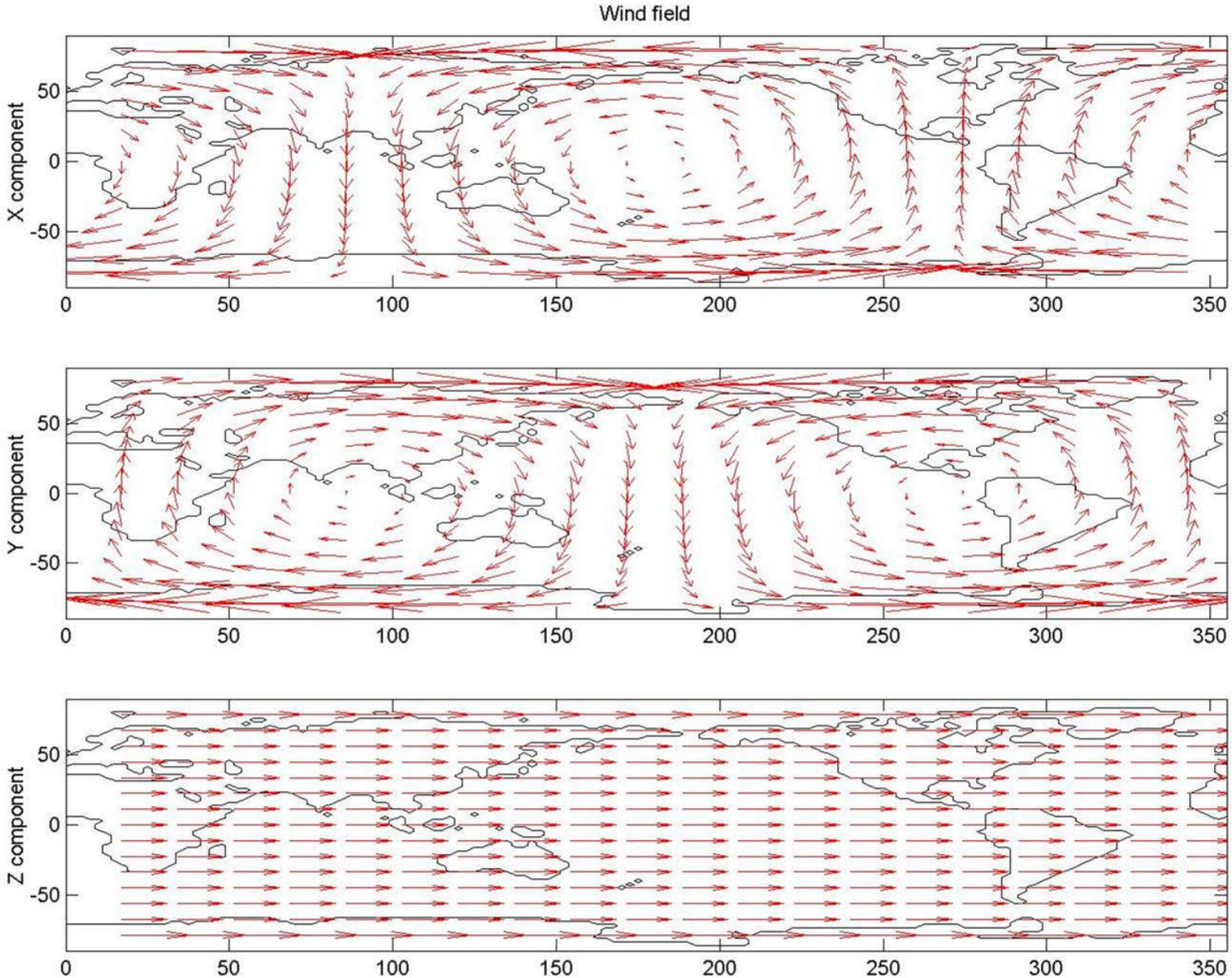
Earth-Atmosphere Interaction at Sub-Diurnal Timescale and its Effect on Earth Rotation

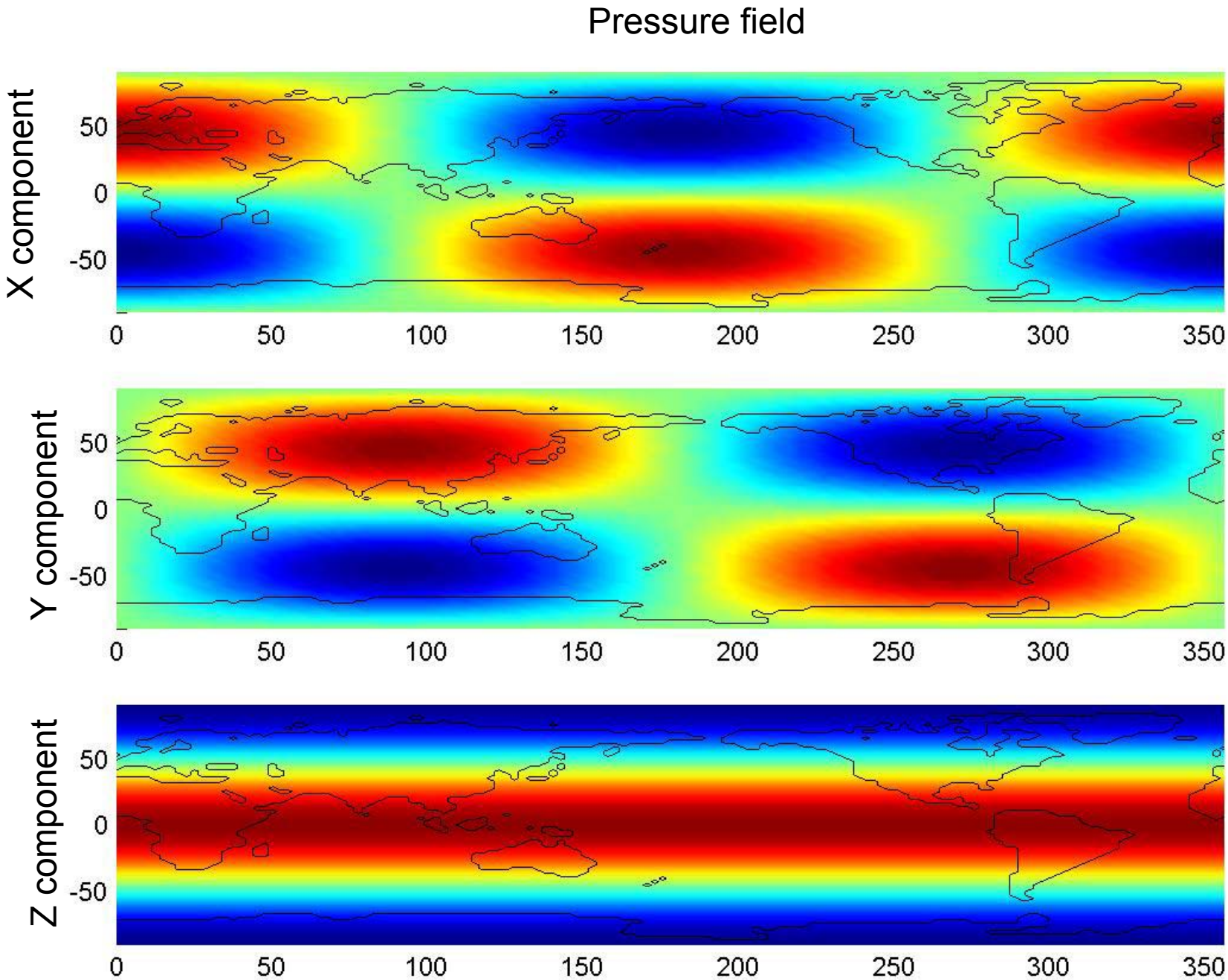
Olivier de Viron

Royal Observatory of Belgium

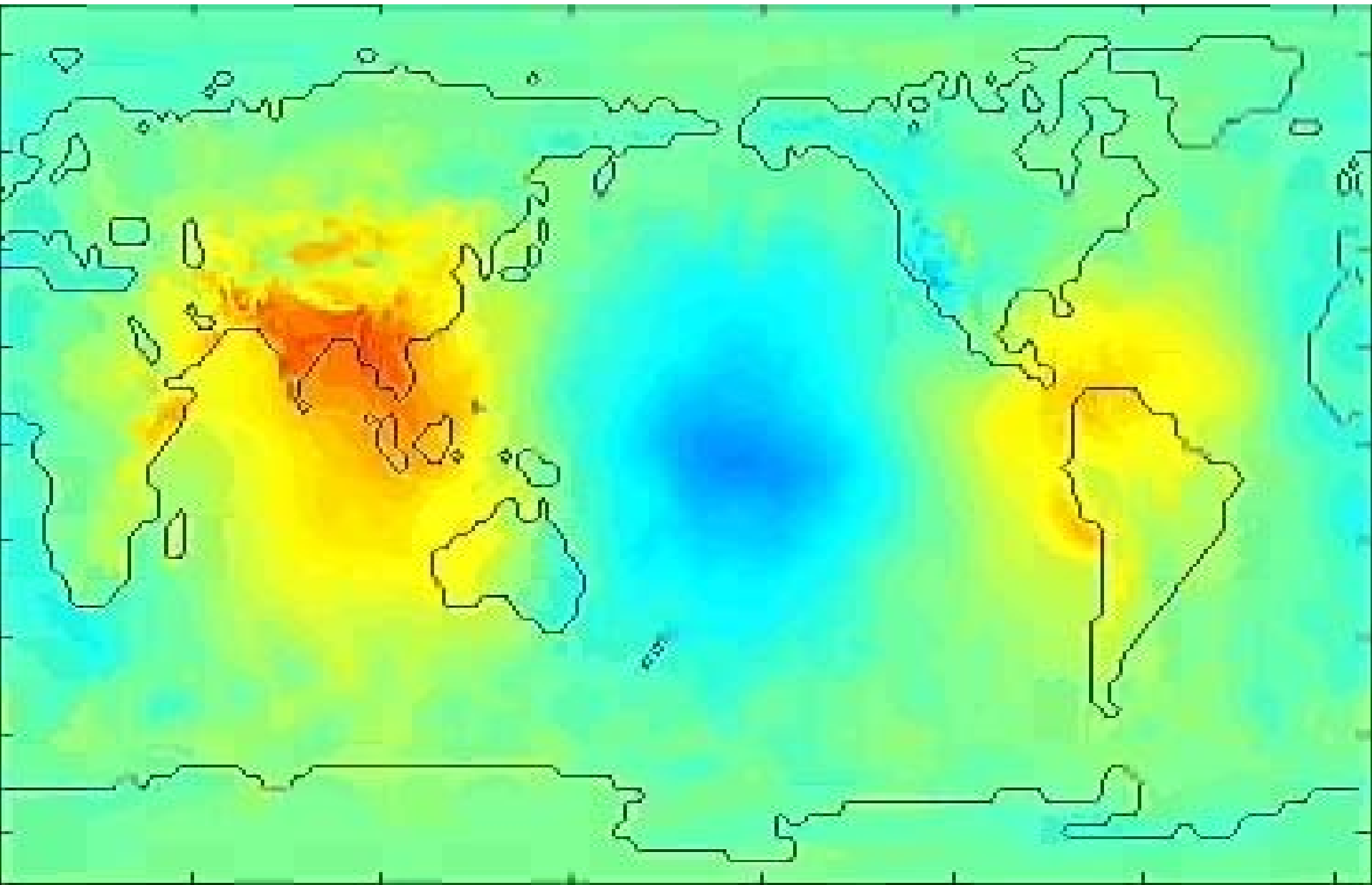
Angular momentum

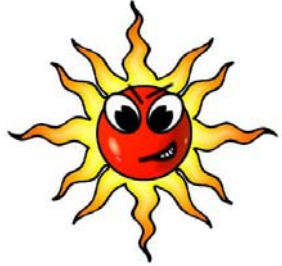



Wind field
X component
Y component
Z component
50
0
-50
0
50
100
150
200
250
300
350


Pressure field
X component
Y component
Z component
50
0
-50
0
50
100
150
200
250
300
350

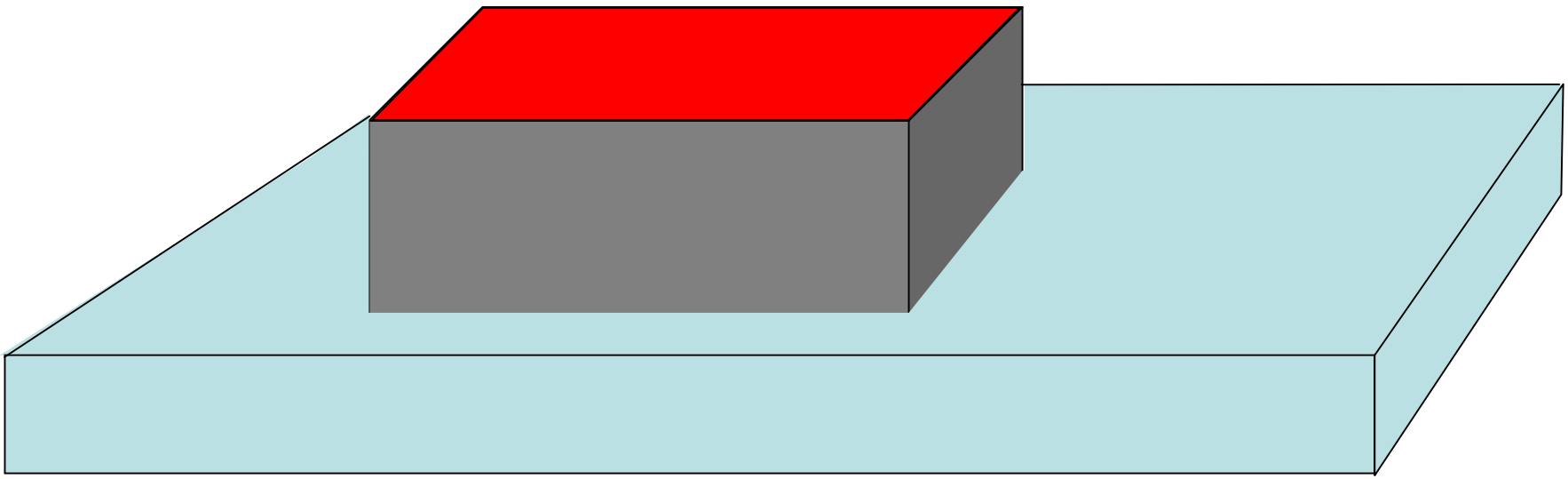
Actual pressure field

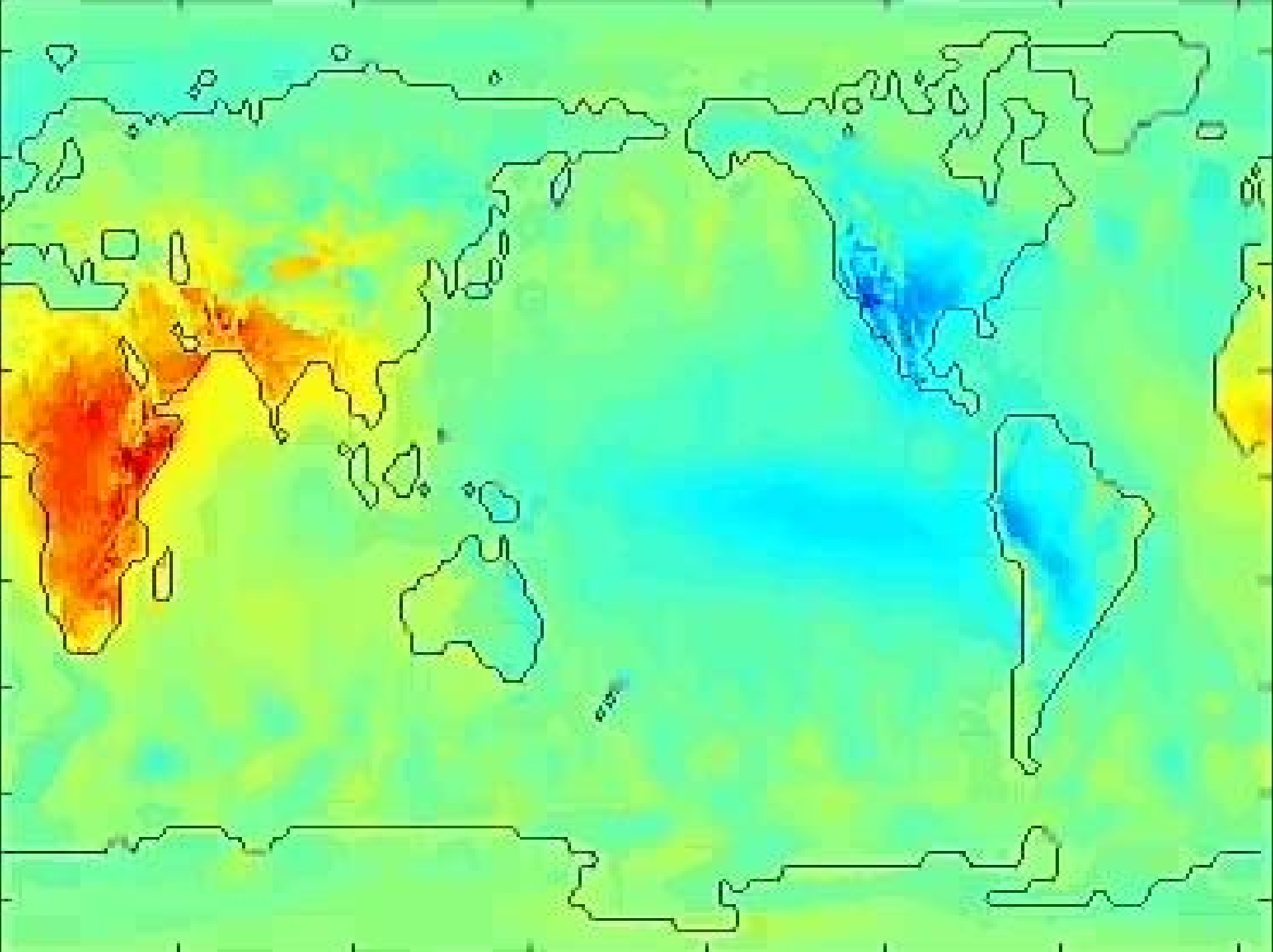


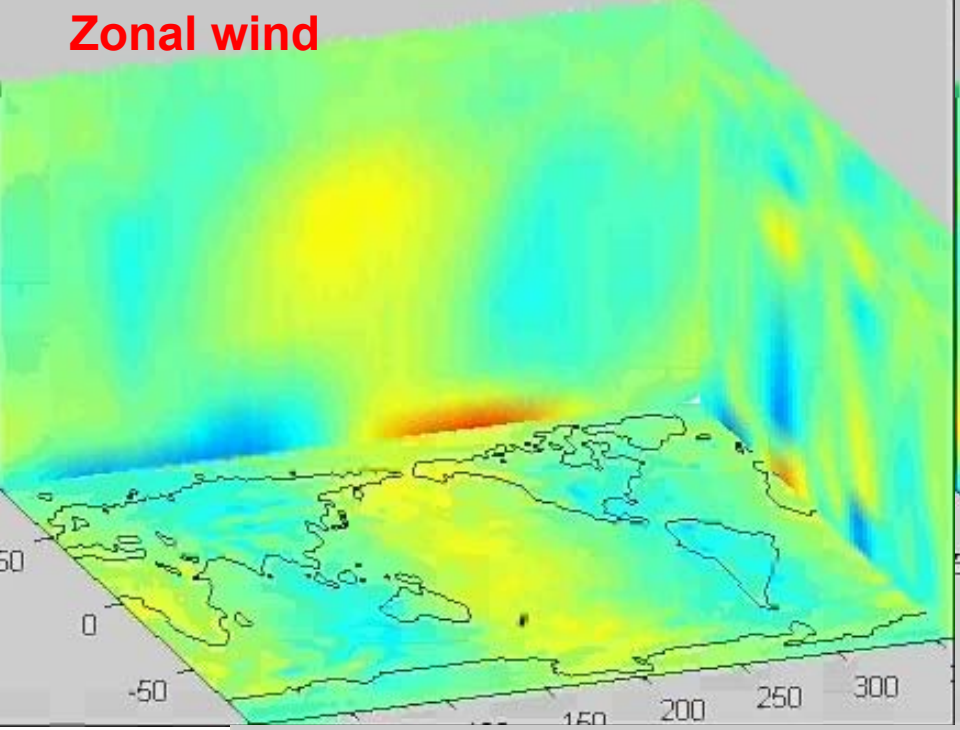


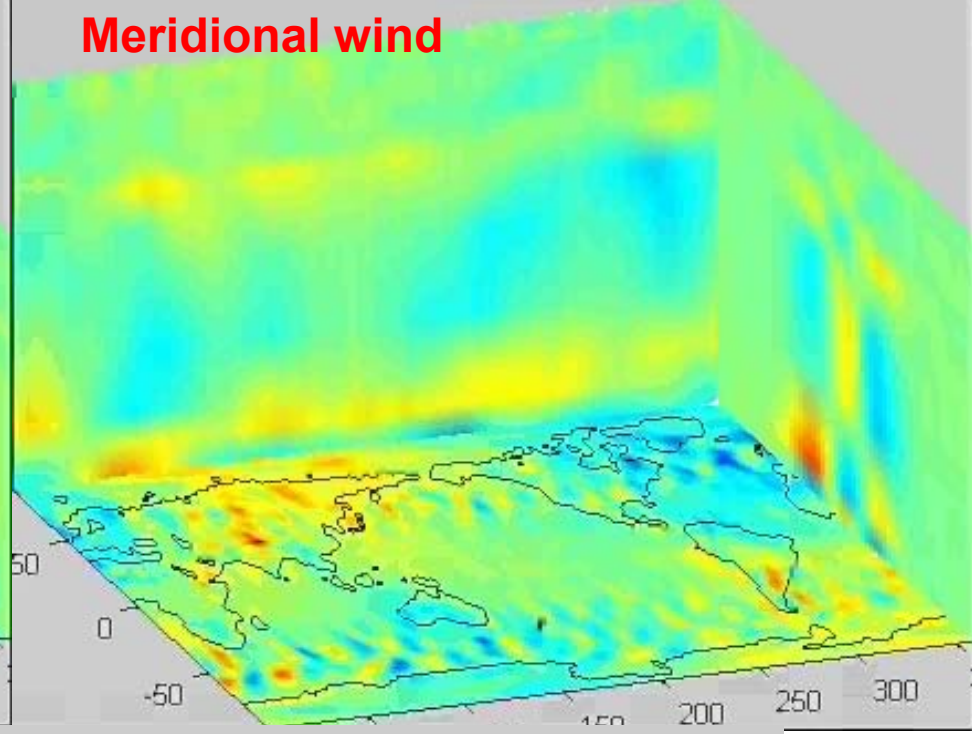
LP

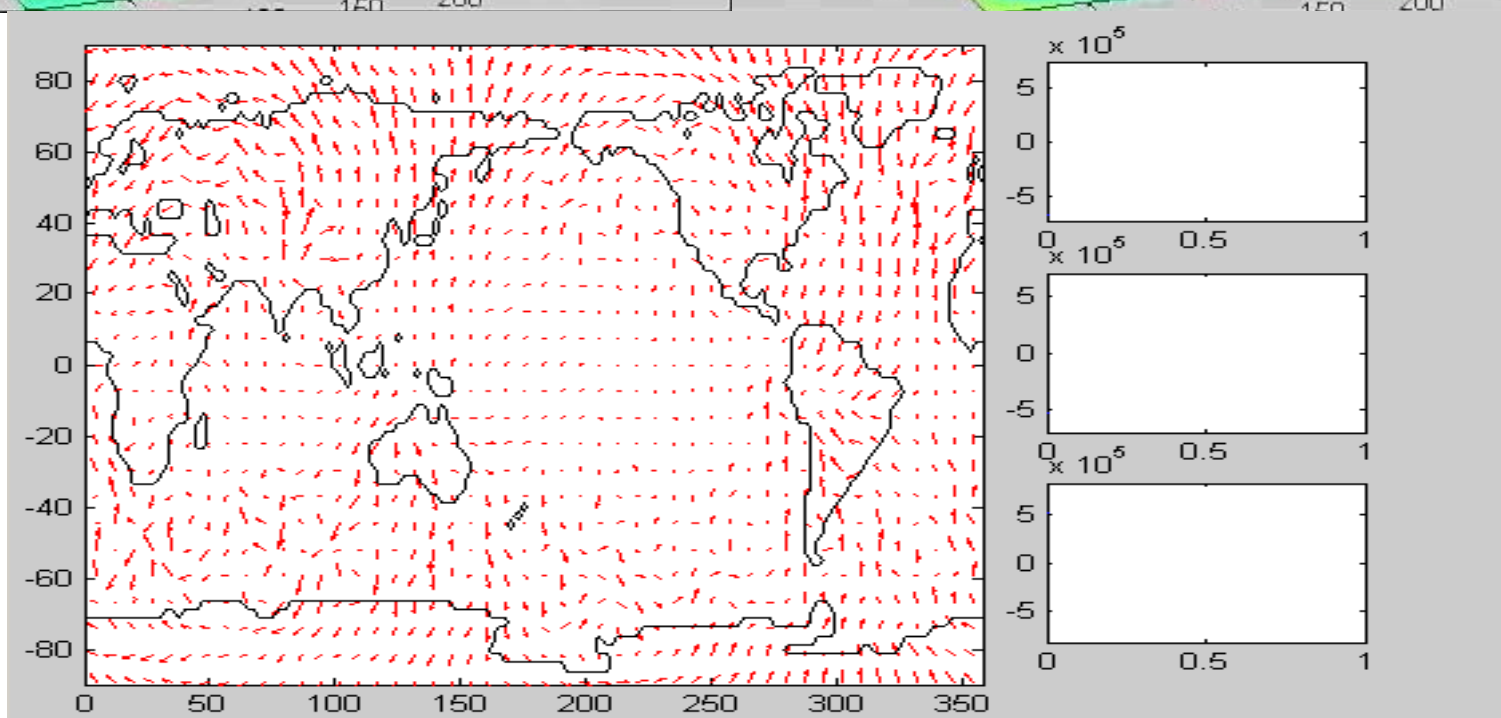
No change



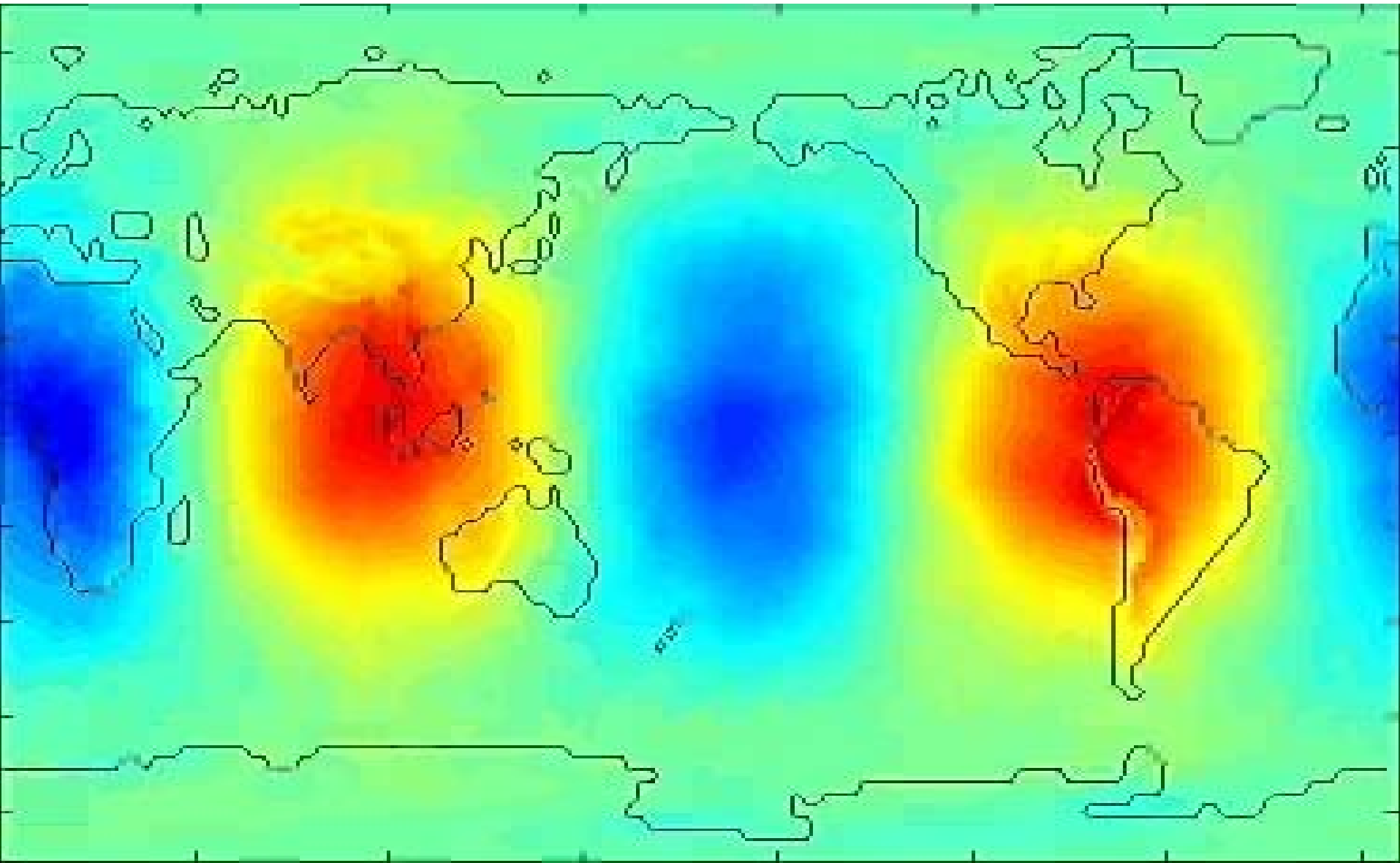


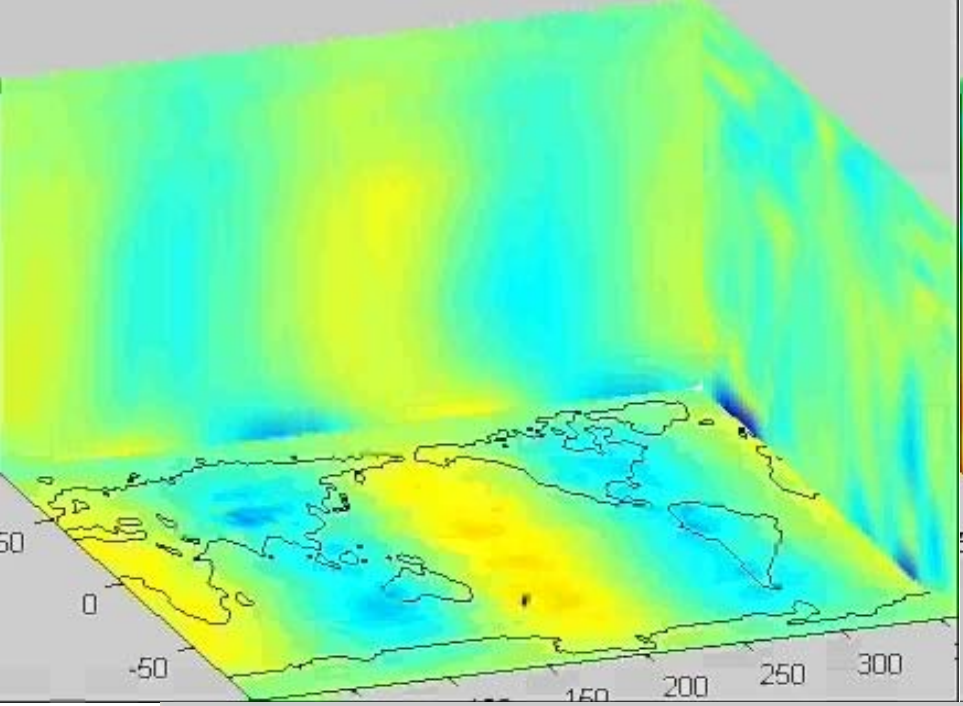

Zonal wind

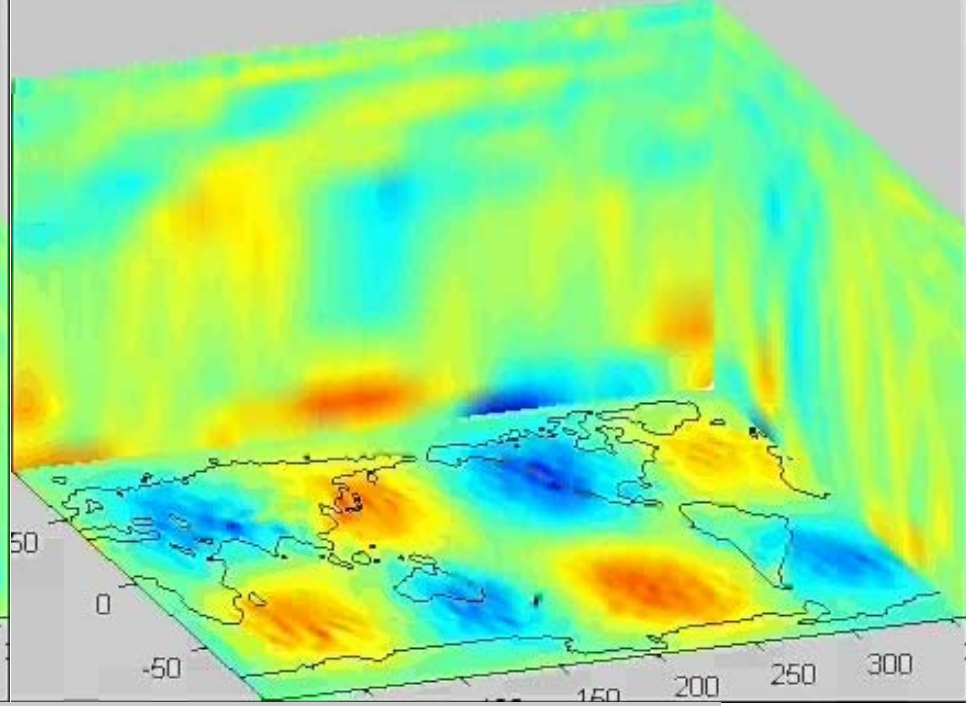

Meridional wind

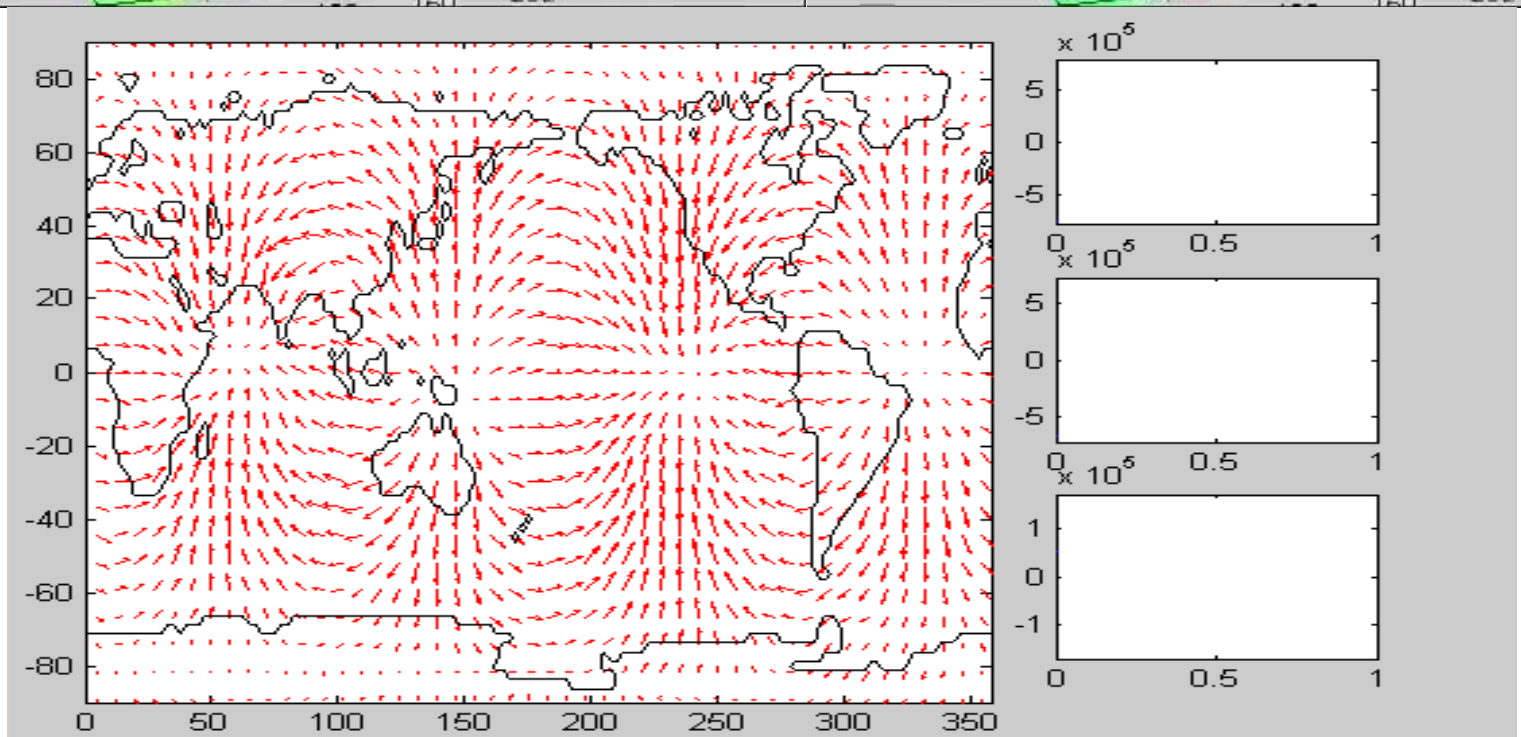

80
60
40
20
0
-20
-40
-60
-80
0
50
100
150
200
250
300
350
x 10^5
5
0
-5
0
0.5
1

Atmospheric mode at S_2

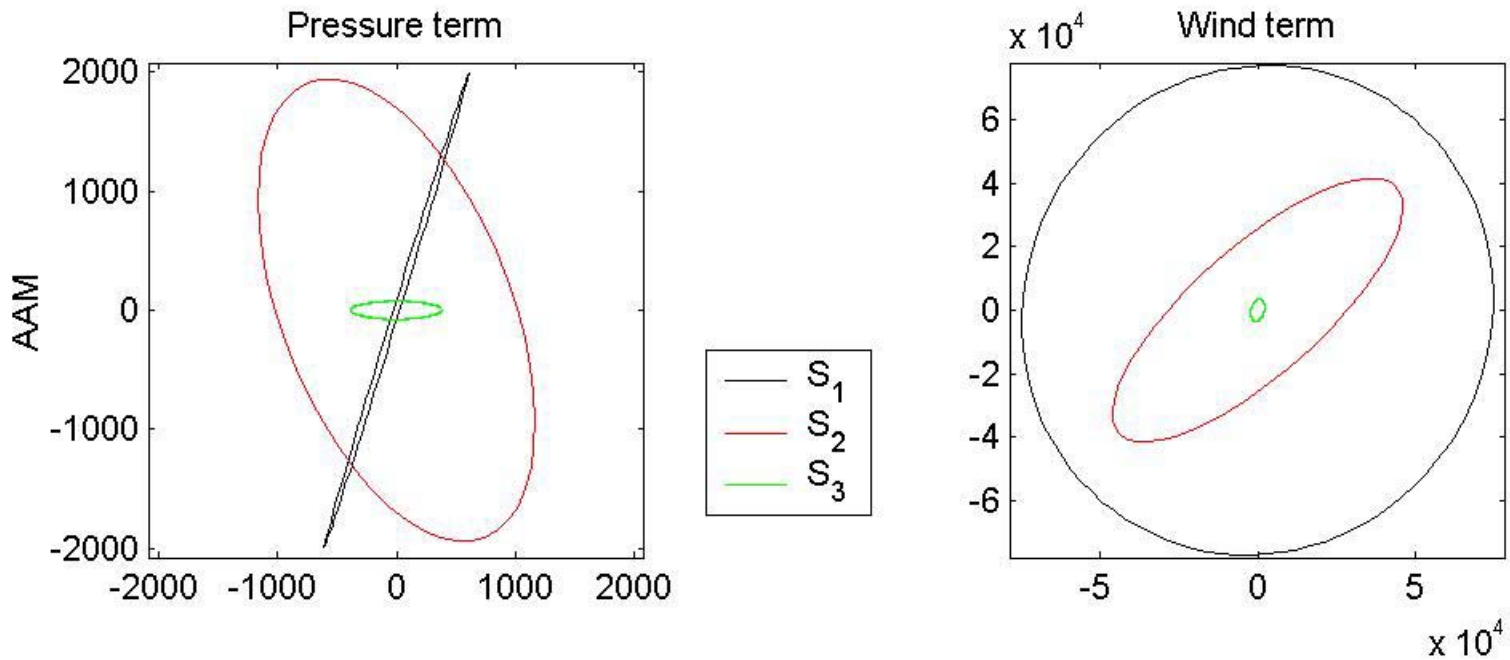


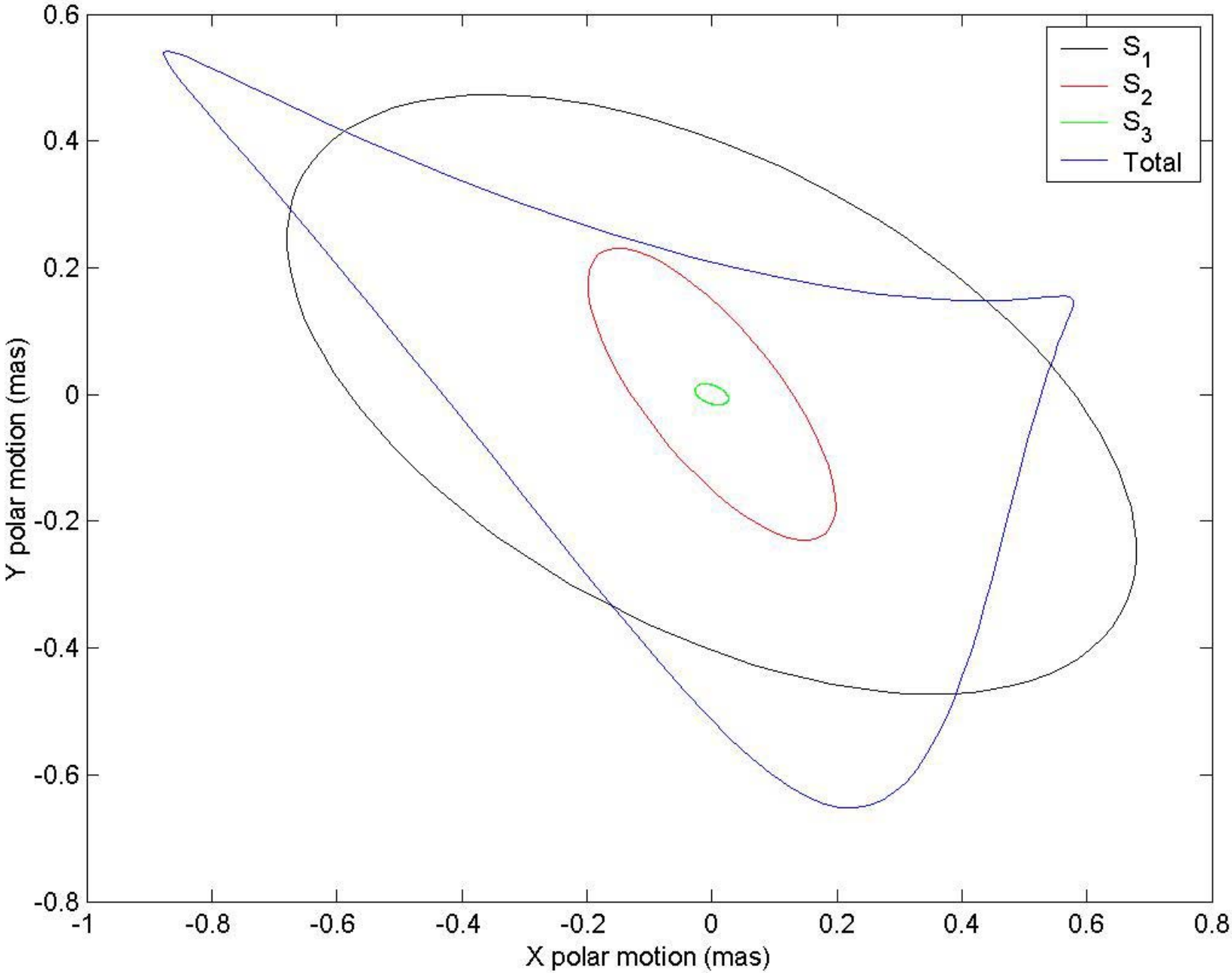

50
0
-50
150
200
250
300

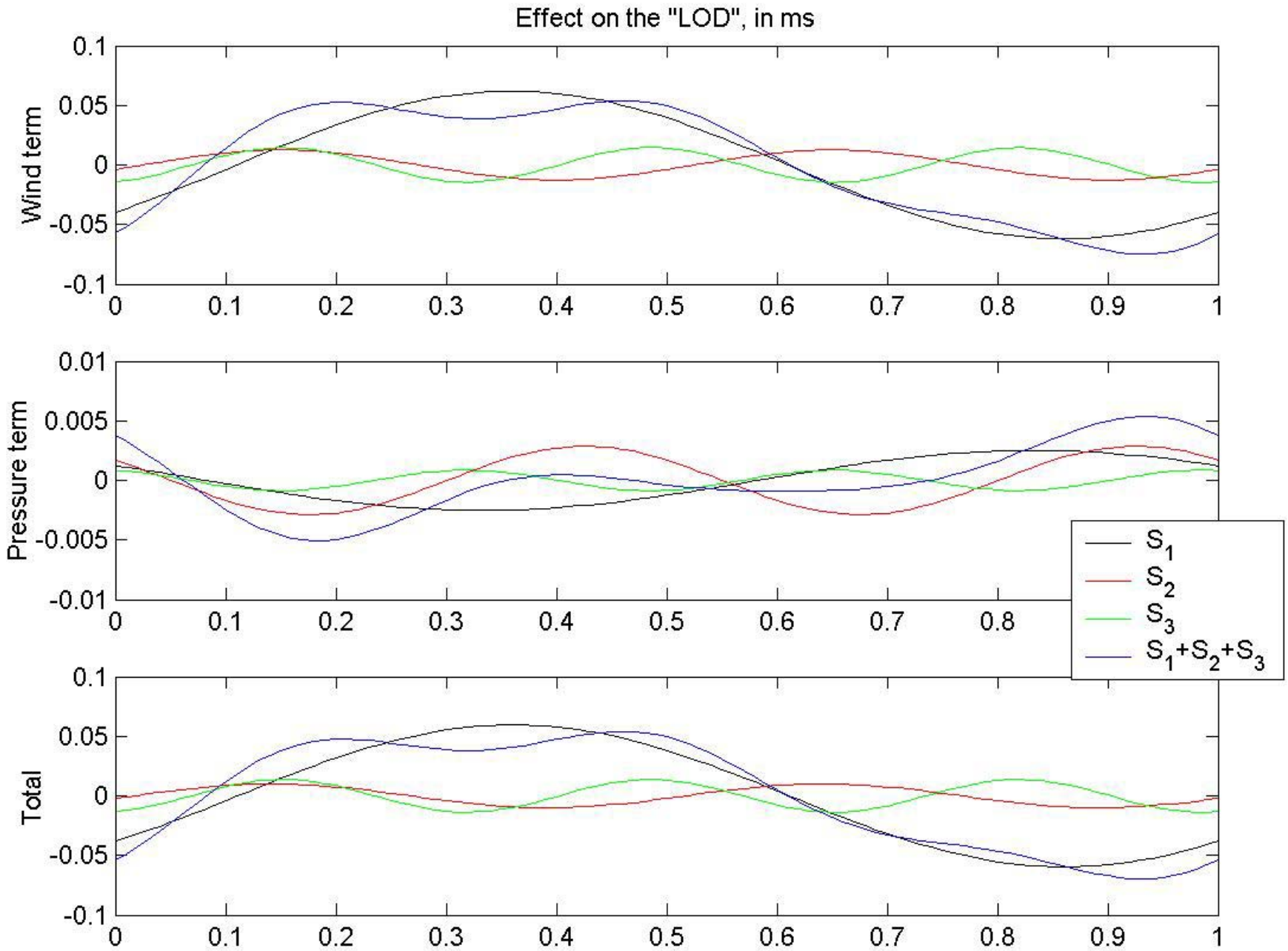

50
0
-50
150
200
250
300


80
60
40
20
0
-20
-40
-60
-80
0
50
100
150
200
250
300
350
x 10^5
5
0
-5
0
0.5
1
x 10^5
5
0
-5
0
0.5
1
x 10^5
1
0
-1
0
0.5
1

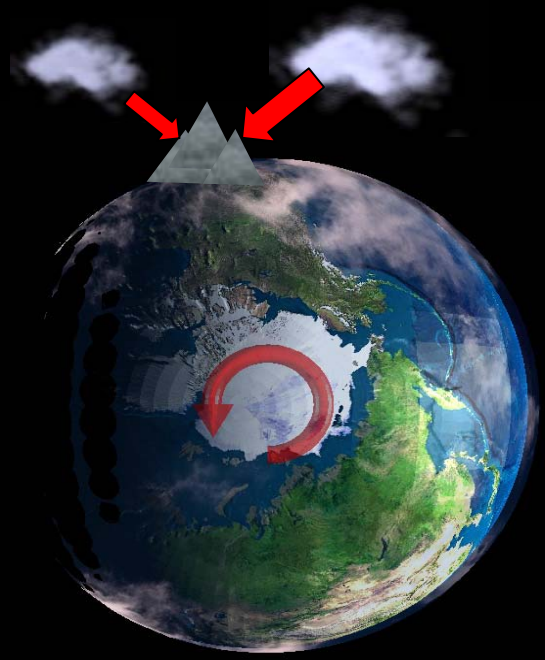
Equatorial angular momentum




S1
S2
S3
Total
Y polar motion (mas)
X polar motion (mas)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8

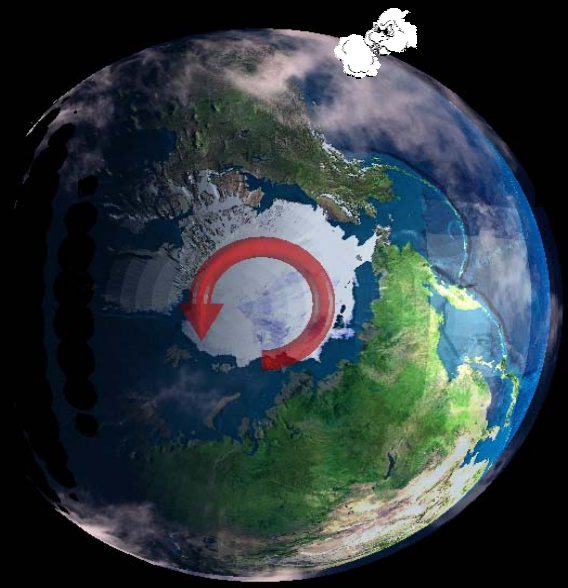

Effect on the "LOD", in ms
Wind term
Pressure term
Total
0.1
0.05
0
-0.05
-0.1
0.01
0.005
-0.005
-0.01
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
S1
S2
S3
S1+S2+S3

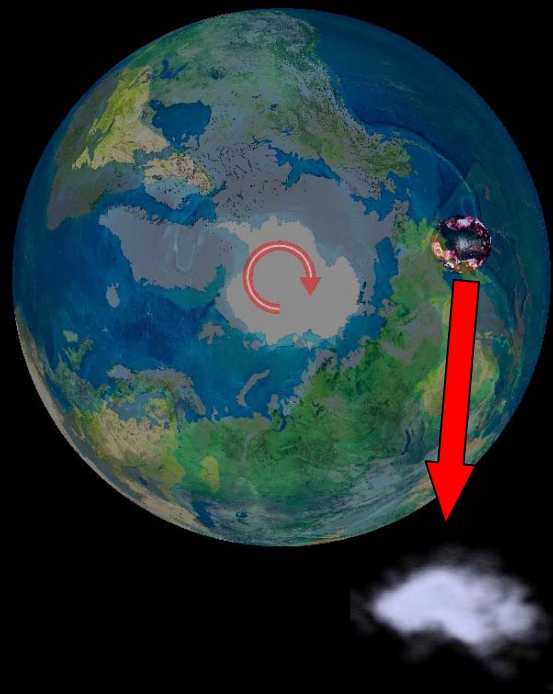
Torques



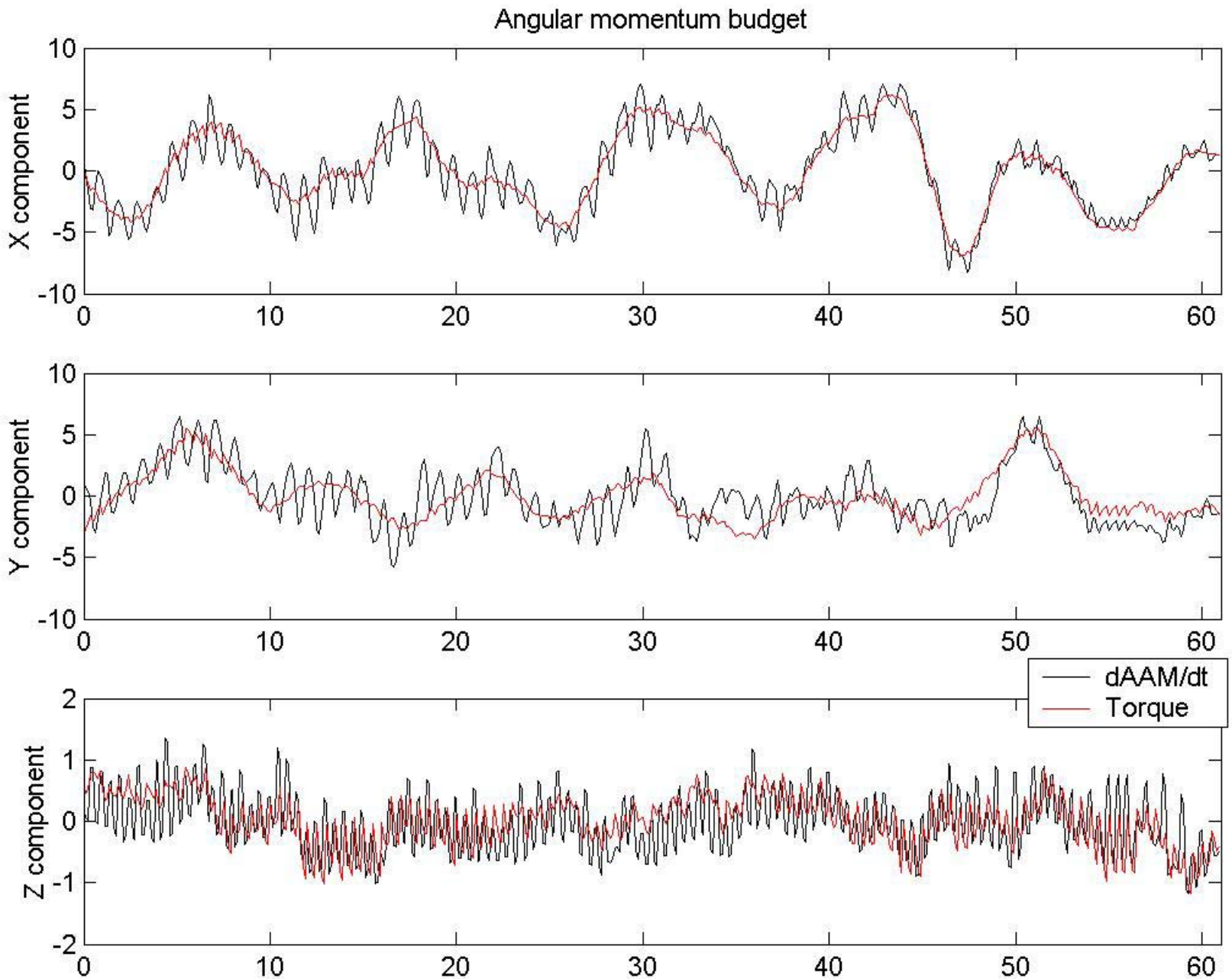
Mountain torque

Friction torque

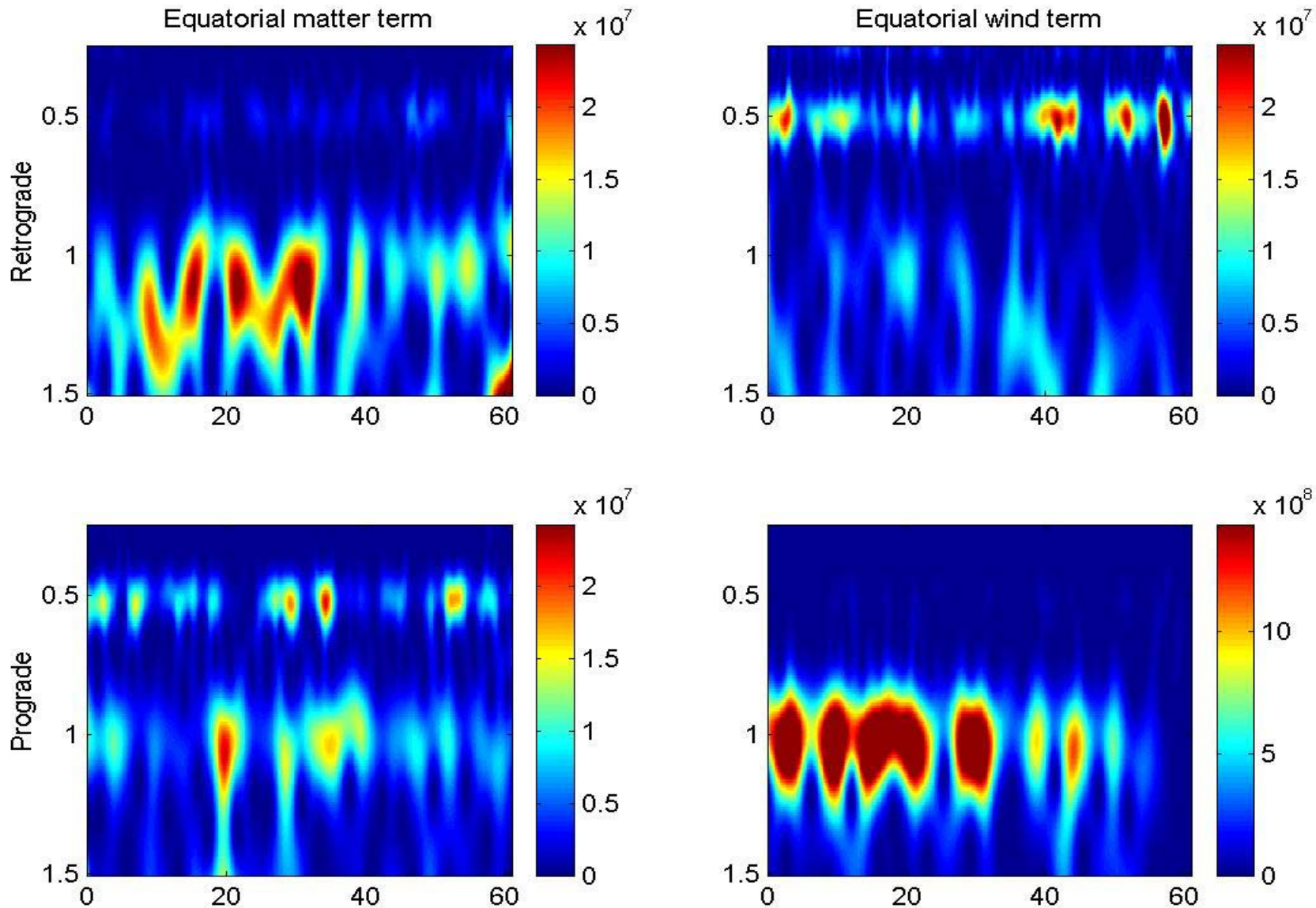




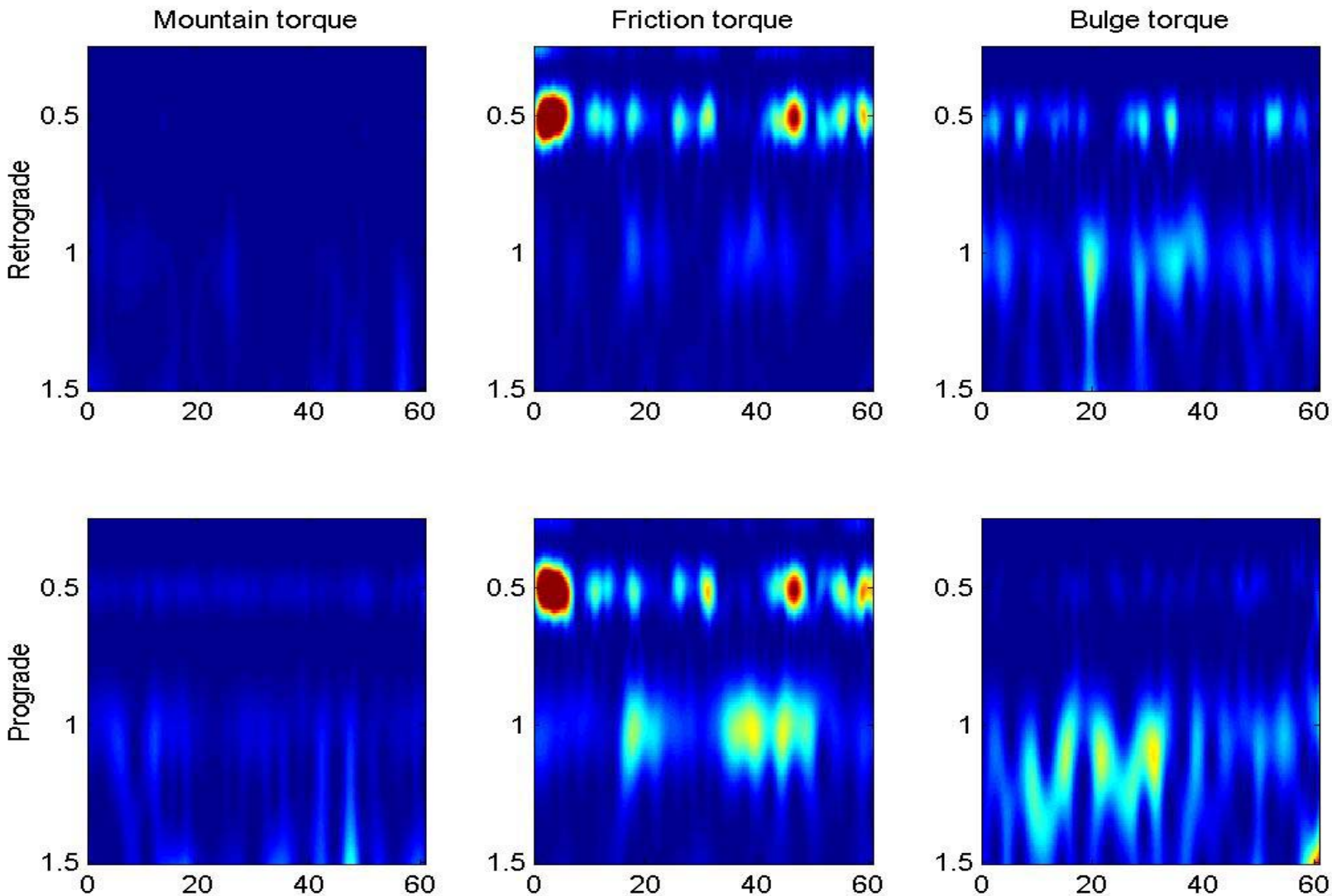
Gravitation torque


Angular momentum budget
X component
Y component
Z component
dAAM/dt
Torque
10
5
0
-5
-10
2
1
-1
-2
0
10
20
30
40
50
60

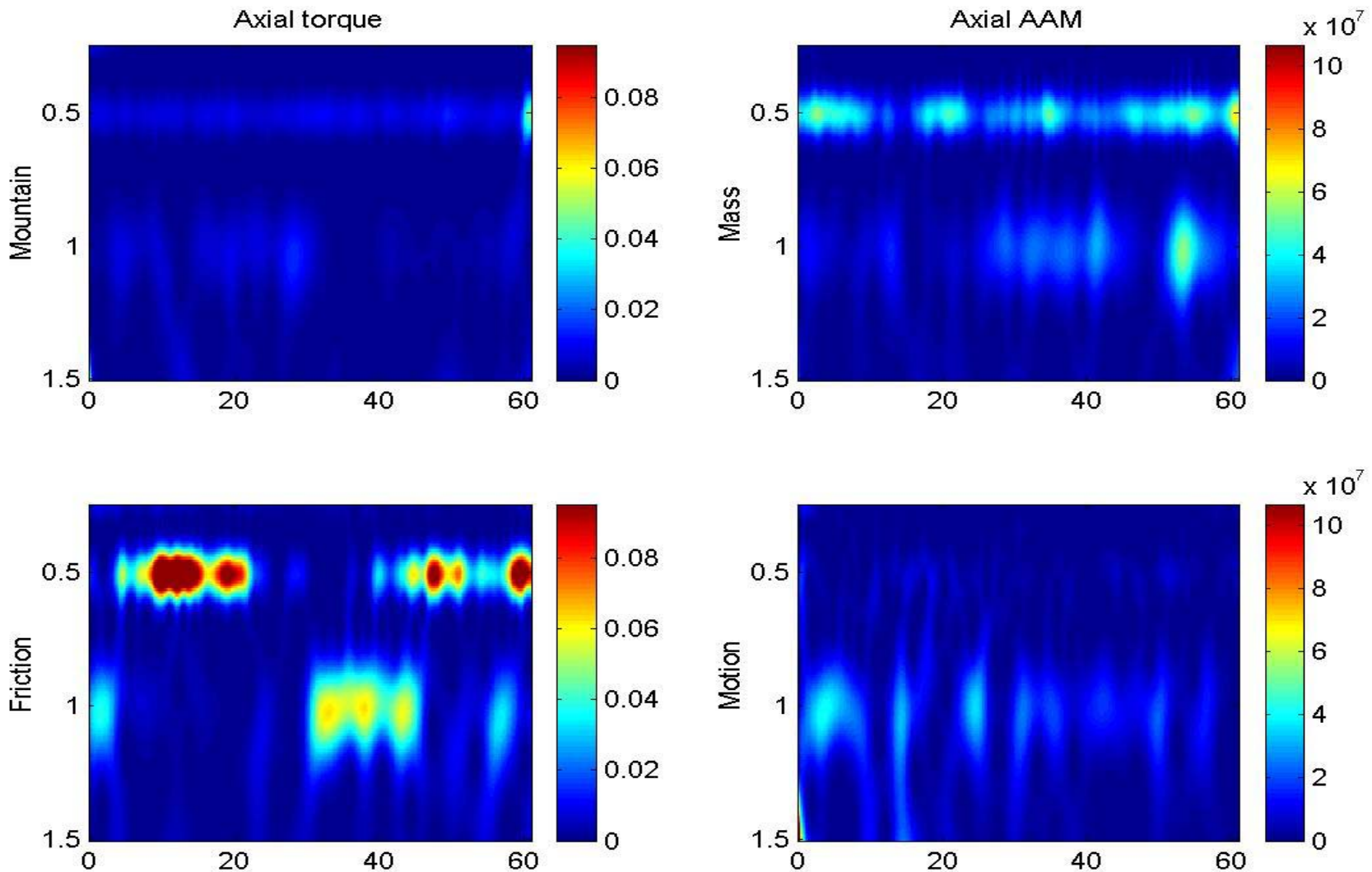
Equatorial AAM



Equatorial torque



Axial component



Conclusions

- Data quality issues (mean day might be better)
- HF signal stronger in the AAM than in the torque
  ⇒ Torque approach cannot be used to explain AAM variation
- Very high time variability of the HF signal
- Strong difference between S_1 and S_2 resulting in a smaller ratio S_2/S_1
- PM signal at the mas level, and LOD signal at the ms level???