DECADAL FLUCTUATIONS IN EARTH'S ROTATION AS EVIDENCES OF THE DRIFT OF LITHOSPHERE OVER ASTENOSPHERE

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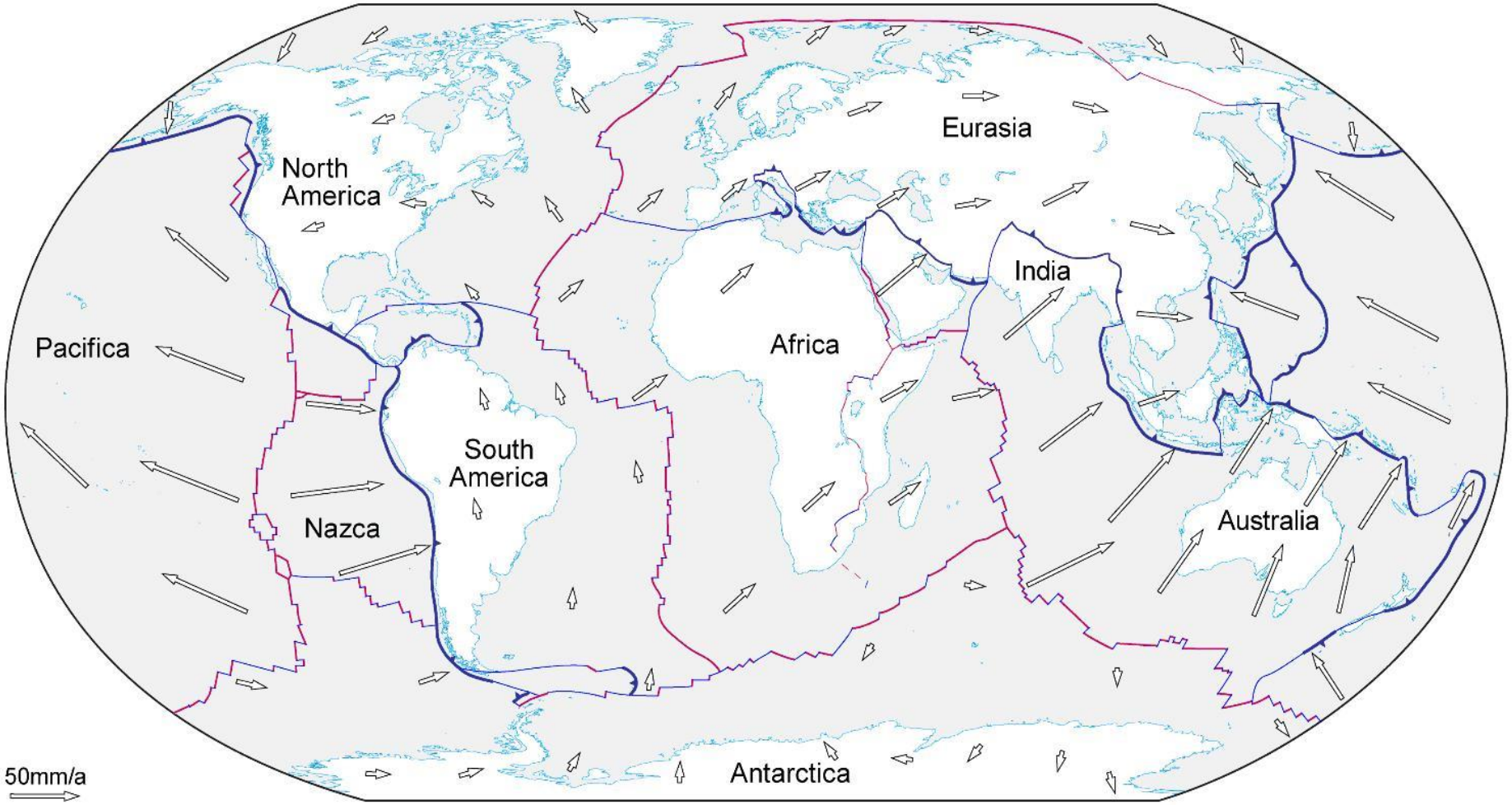
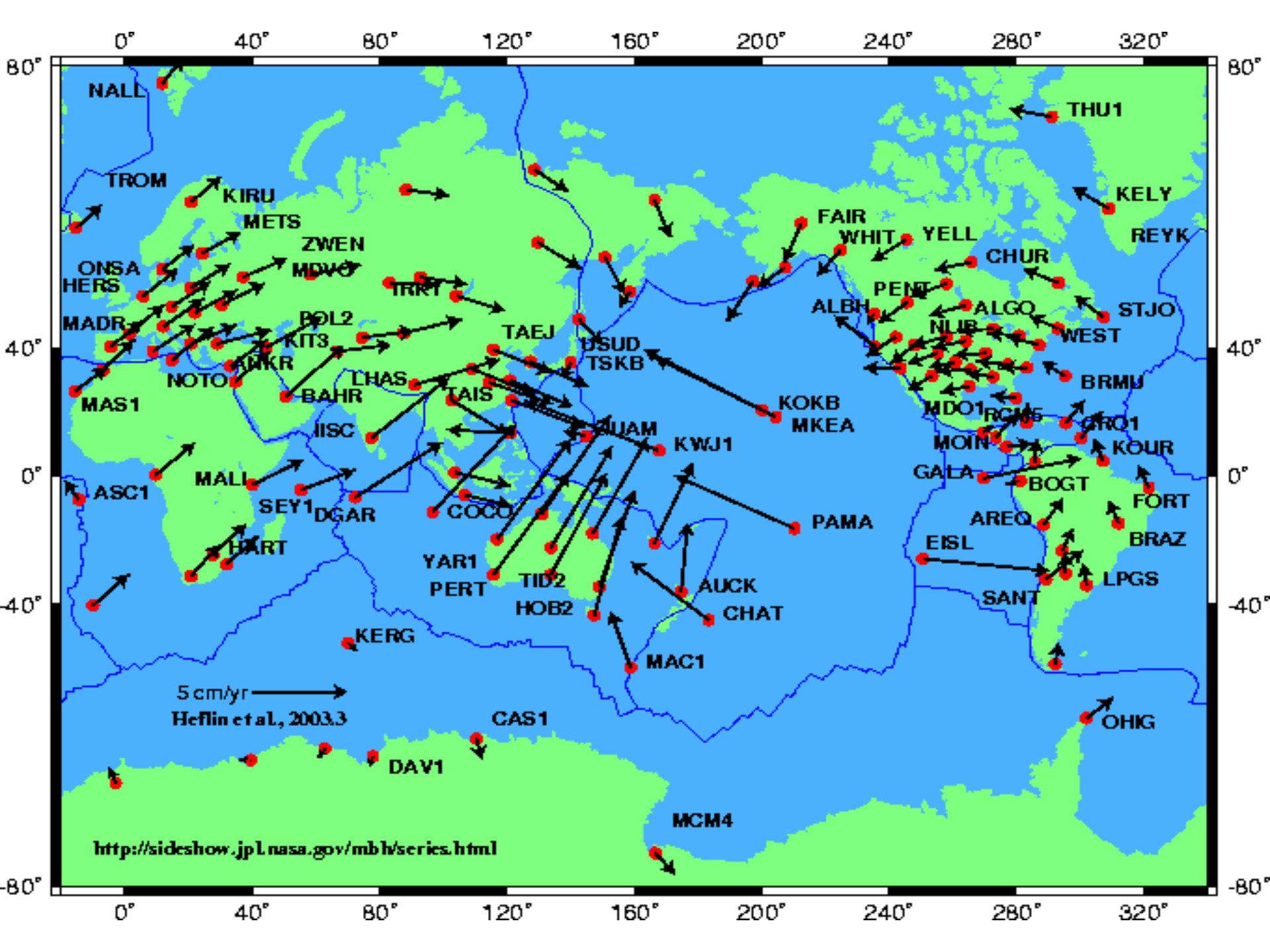
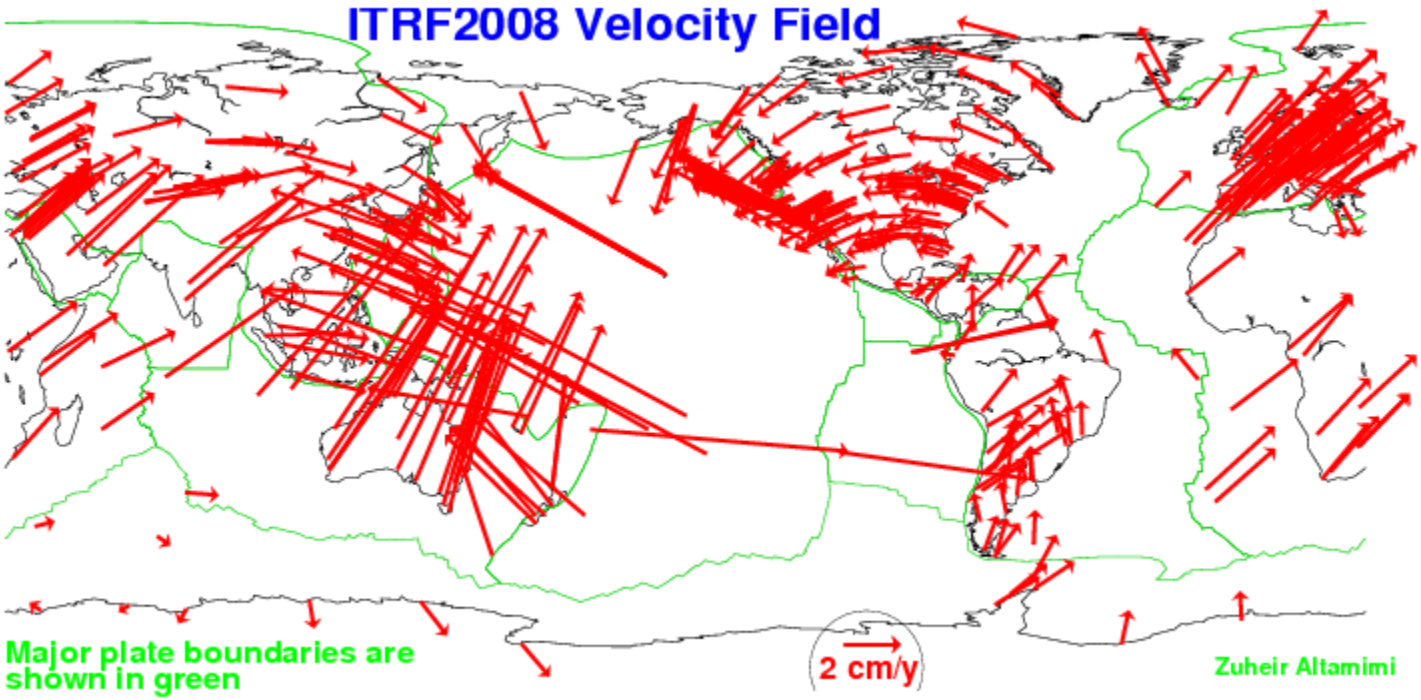
The decadal instabilities in Earth's rotation (DIER) are thought to be caused by the interactions between the Earth's core and its mantle.

An alternative to the core-mantle interaction hypothesis is presented here. This alternative hypothesis claims that the DIER are actually caused by fluctuations in the angular velocity of lithospheric drift over the asthenosphere.. The sliding of the lithosphere over the asthenosphere is possible due to of the vibrational displacement mechanism produced by tidal forces. The lithospheric plates exhibit vibrational displacements over the asthenosphere in the horizontal direction by shear stresses caused by friction wind, and ocean currents. There is abundant evidence supporting this lithospheric drift model.

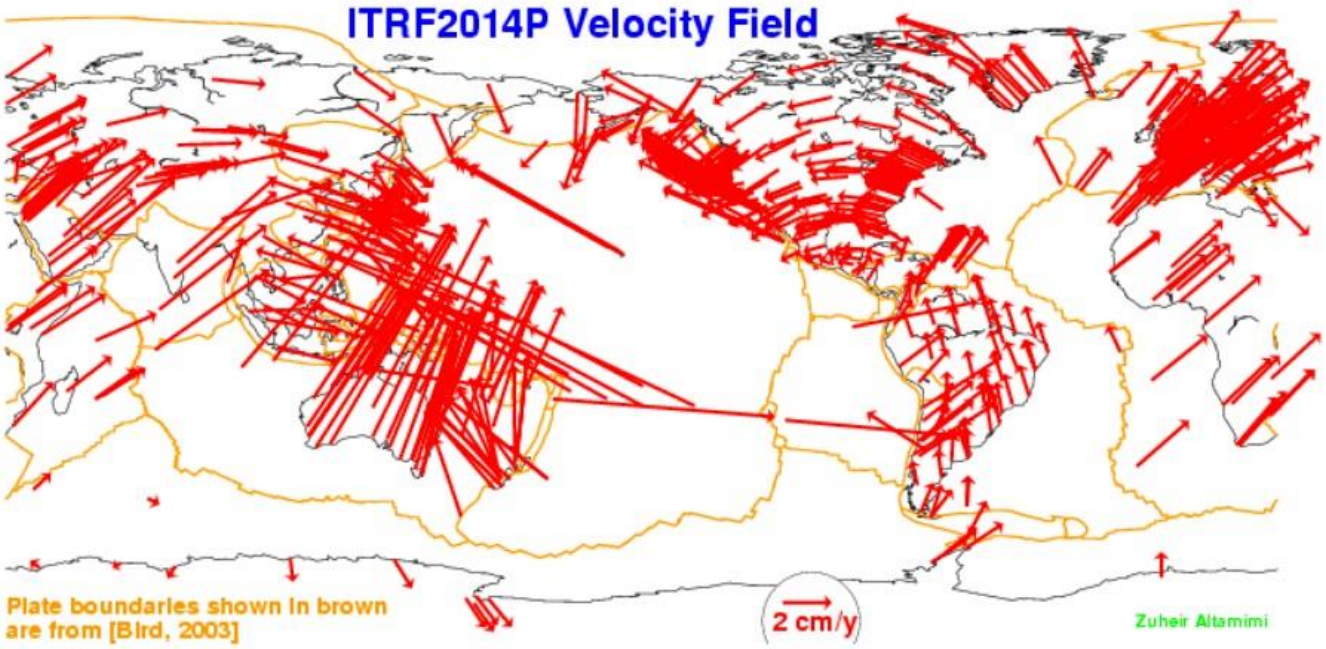


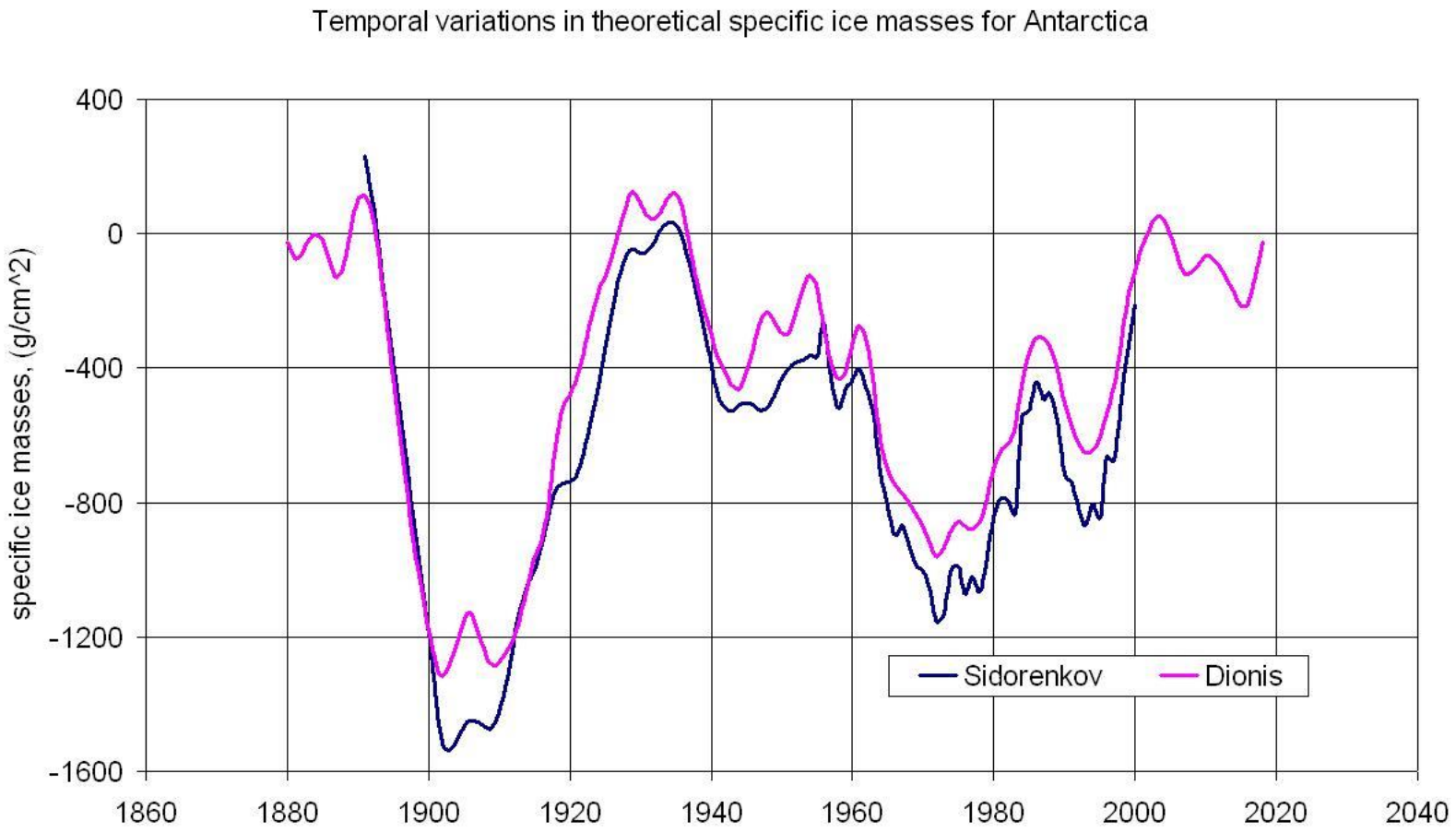
Current absolute plate motion from GPS information (world Robinson projection). Length of arrows indicates rate of movement of that part of the plate
http://www.files.ethz.ch/structuralgeology/jpb/files/english/1Introtecto.pdf

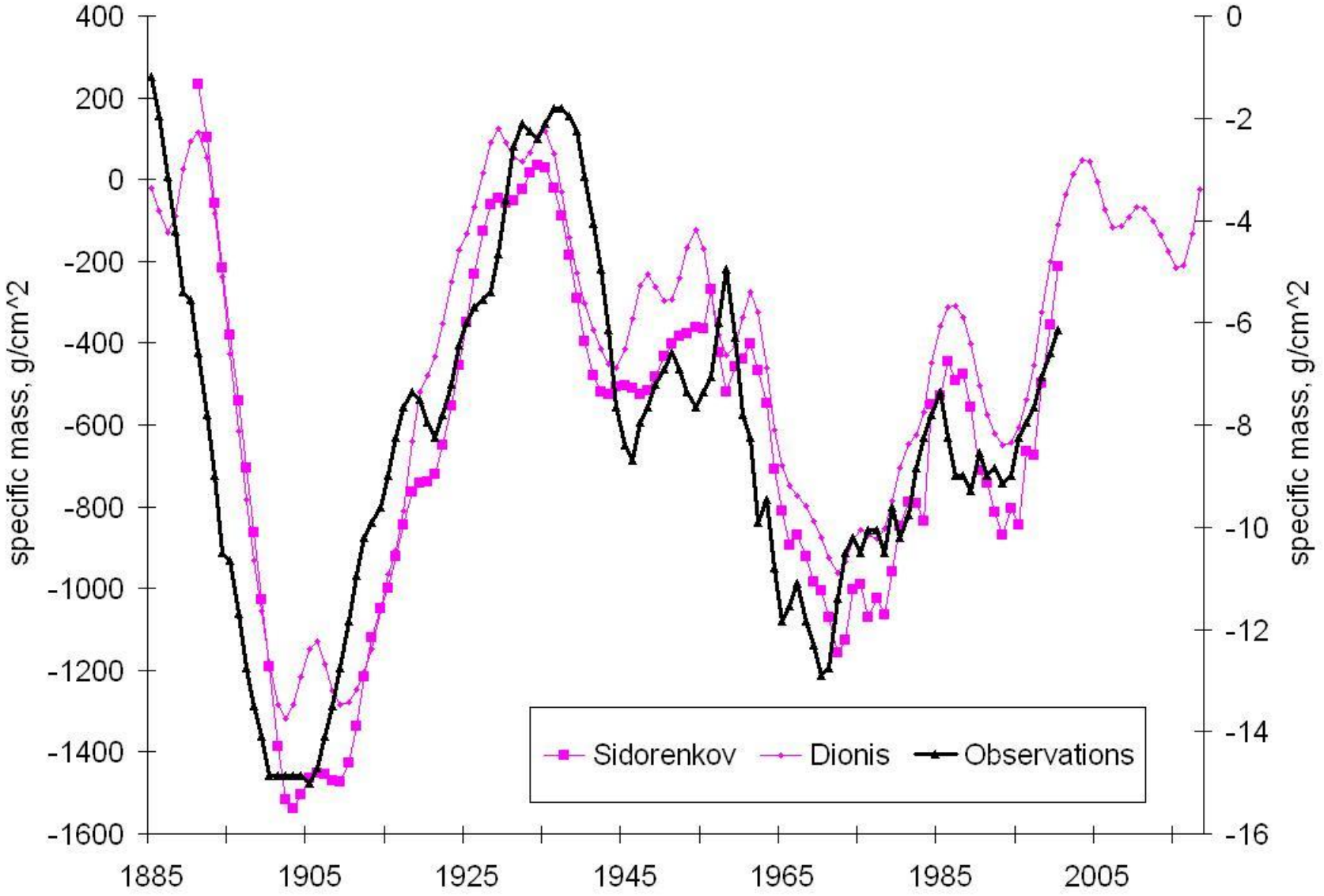

0°
40°
80°
120°
160°
200°
240°
280°
320°
80°
40°
0°
-40°
-80°
NALL
THU1
TROM
KIRU
METS
ZWEN
MDVO
KELY
REYK
FAIR
WHIT
YELL
CHUR
ONSA
HERS
TRRT
PENT
ALBH
ALGO
STJO
NLIB
WEST
MADR
BOL2
KIT3
TAEJ
USUD
TSKB
BRMU
NOTO
AMKR
LHAS
BAHR
TAIS
MAS1
KOKB
MKEA
MDO1
RCM5
CRO1
IISC
GUAM
KWJ1
MOIN
KOUR
GALA
BOGT
ASC1
MALI
SEY1
DGAR
COCO
PAMA
FORT
AREQ
BRAZ
HART
EISL
YAR1
PERT
TID2
AUCK
LPGS
HOB2
CHAT
SANT
KERG
MAC1
5 cm/yr
Heflin et al., 2003.3
CAS1
OHIG
DAV1
MCM4
http://sideshow.jpl.nasa.gov/mbh/series.html


ITRF2008 Velocity Field
Major plate boundaries are shown in green
2 cm/y
Zuheir Altamimi

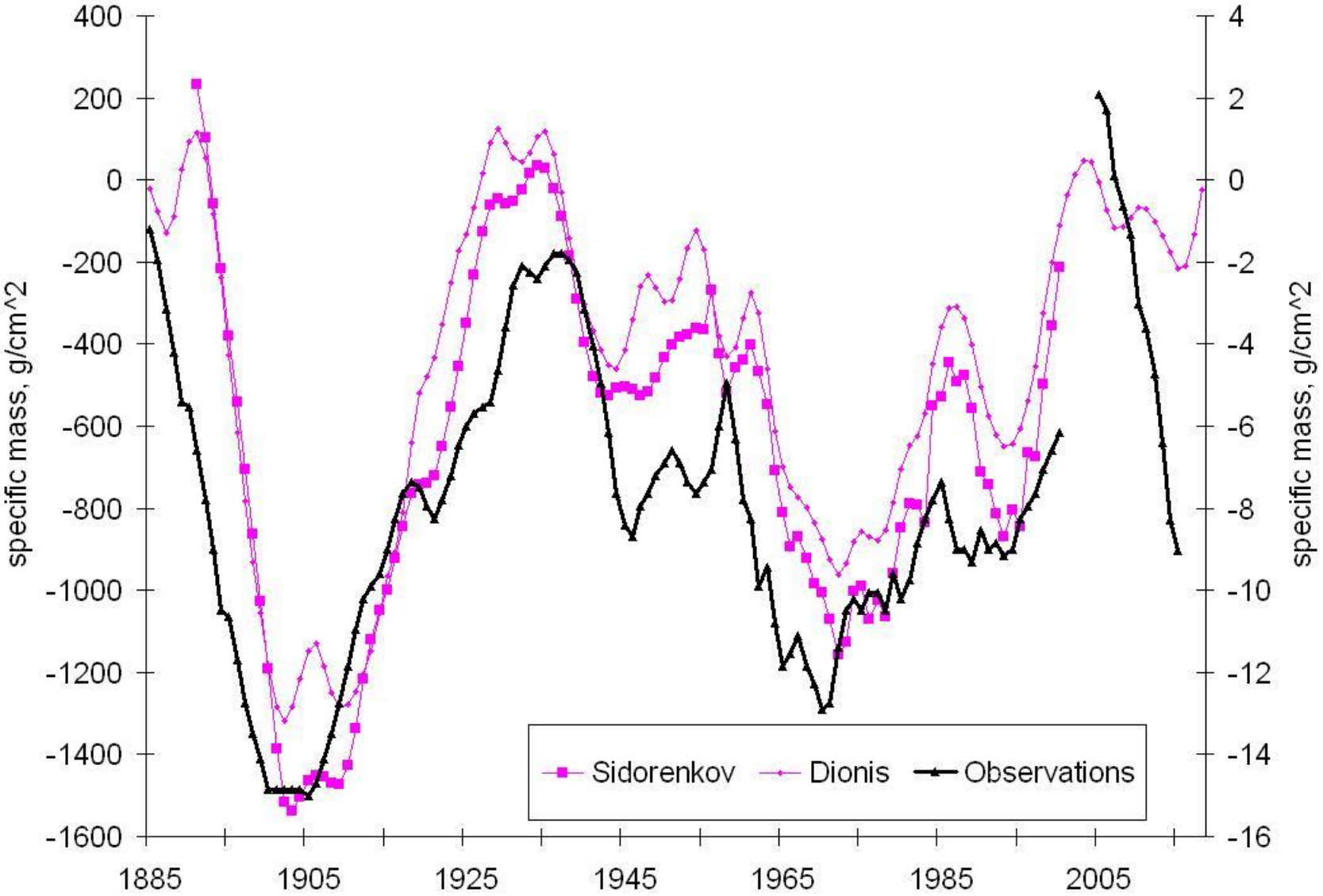
ITRF2014P: Horizontal Velocities



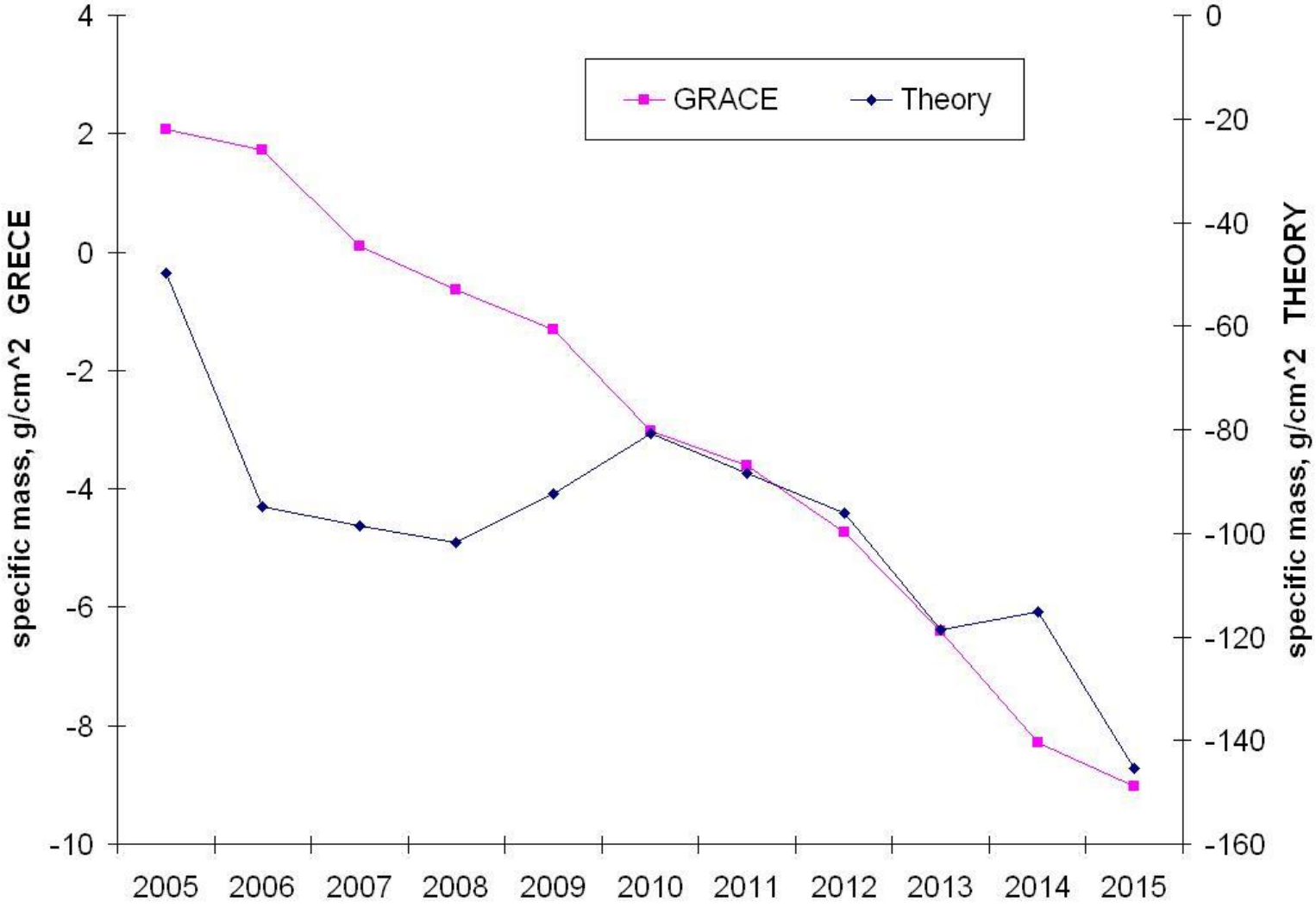

Temporal variations in theoretical specific ice masses for Antarctica
specific ice masses, (g/cm^2)
400
0
-400
-800
-1200
-1600
1860
1880
1900
1920
1940
1960
1980
2000
2020
2040
Sidorenkov
Dionis



Temporal variations the specific mass of ice in Antarctica obtained from theoretical calculations and observations (r=0,84)



Temporal variations the specific mass of ice in Antarctica obtained from theoretical calculations and observations



Temporal variations the specific mass of ice in Antarctic obtained from theoretical calculation and GREAE data

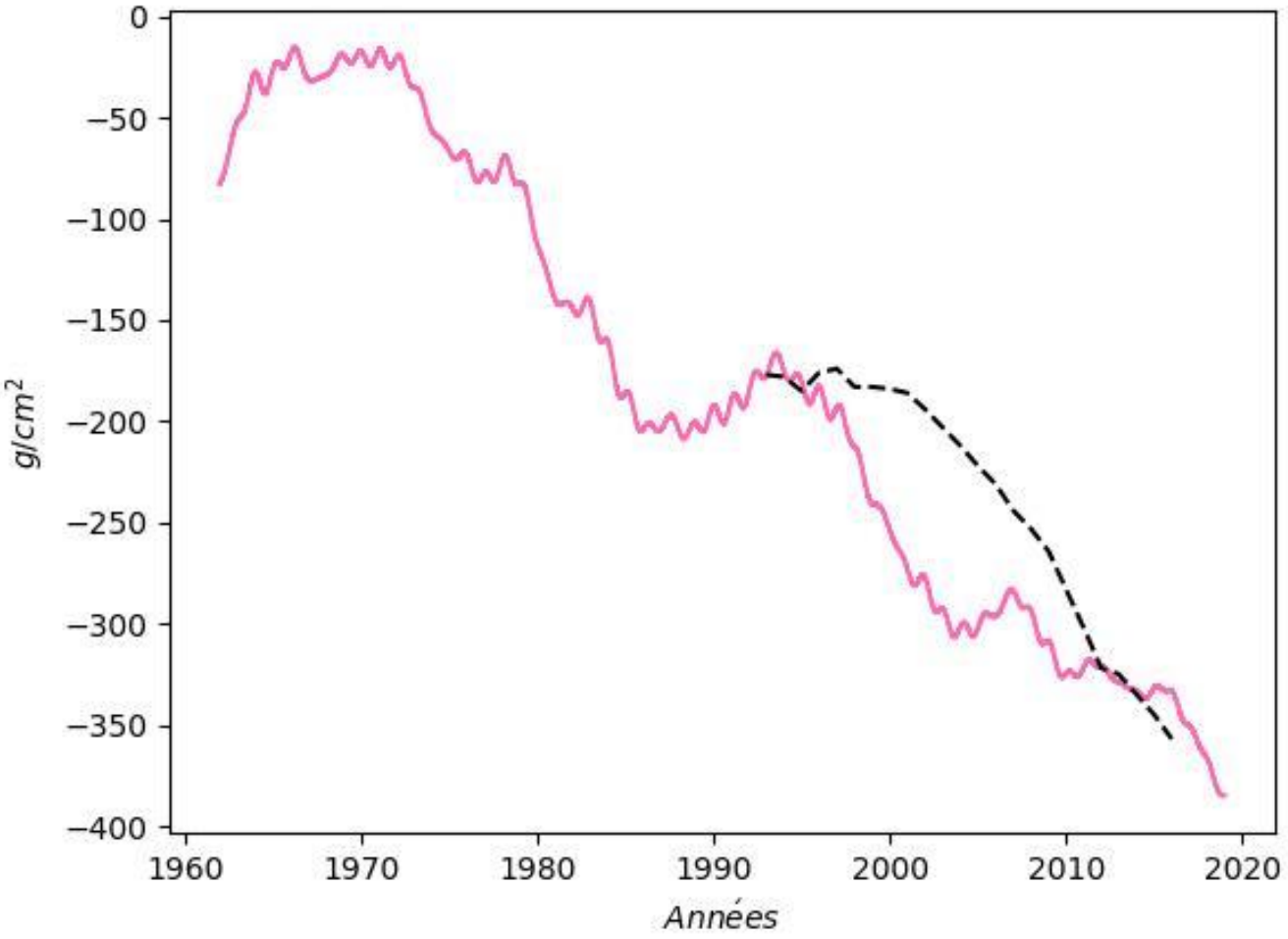
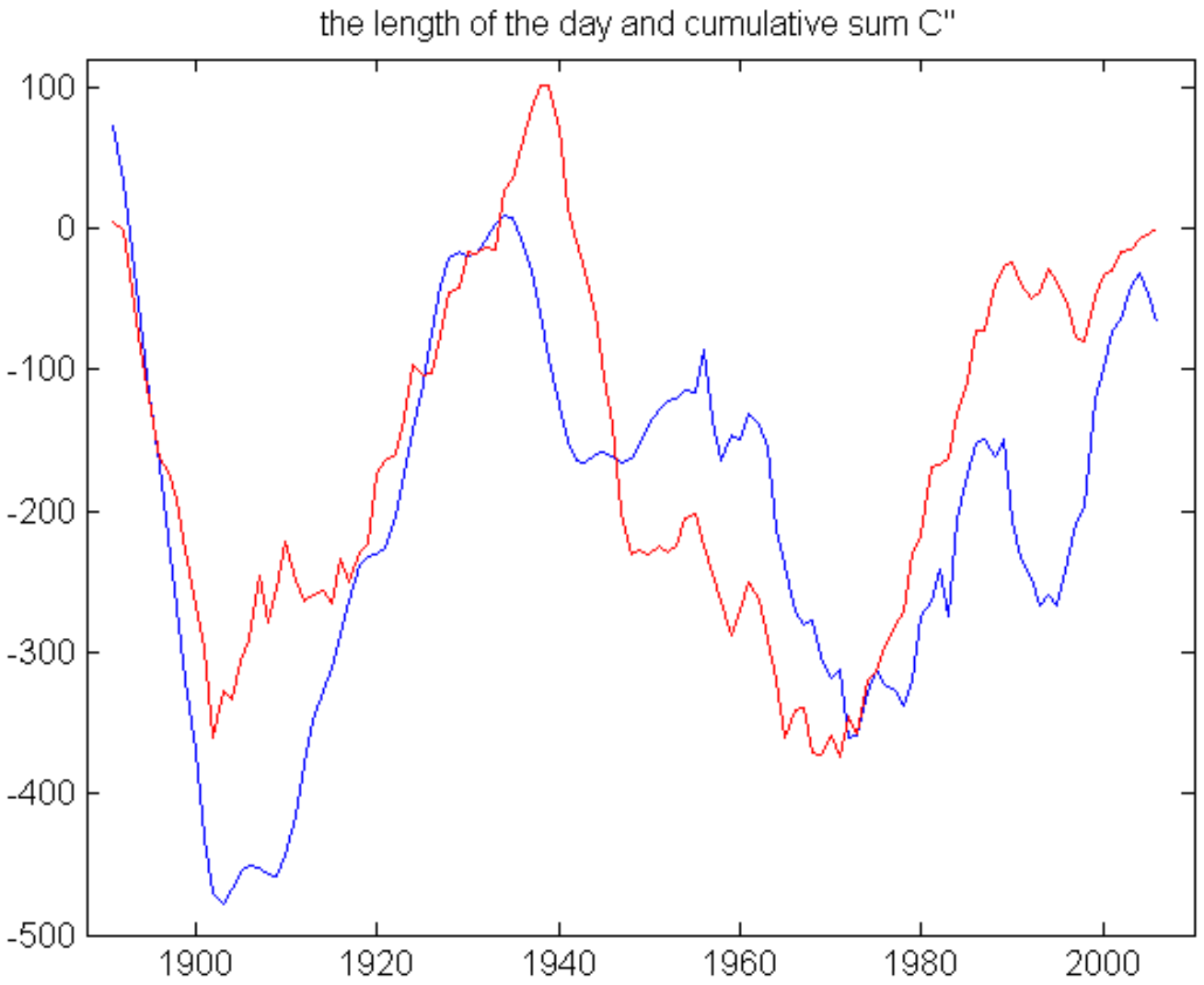
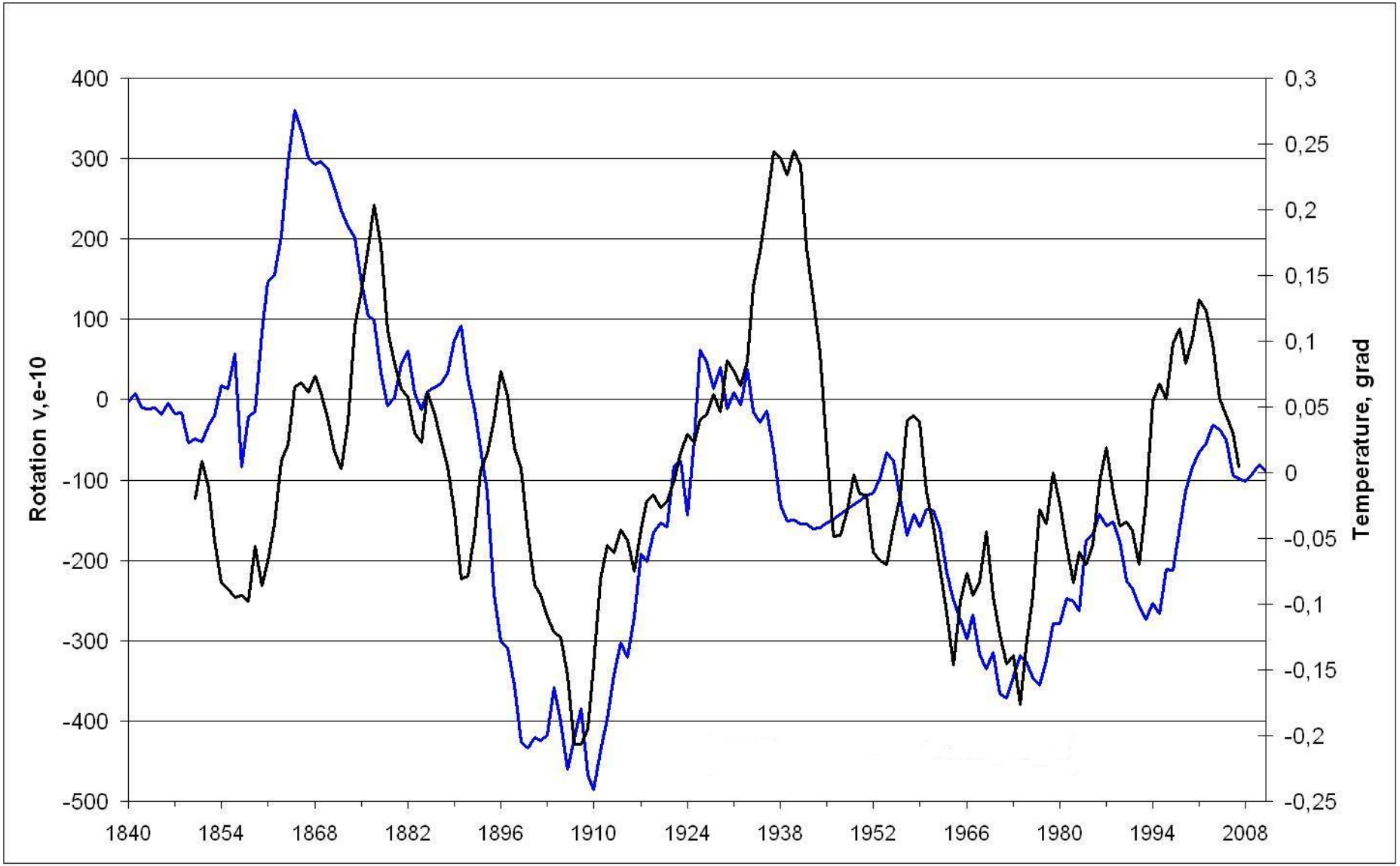


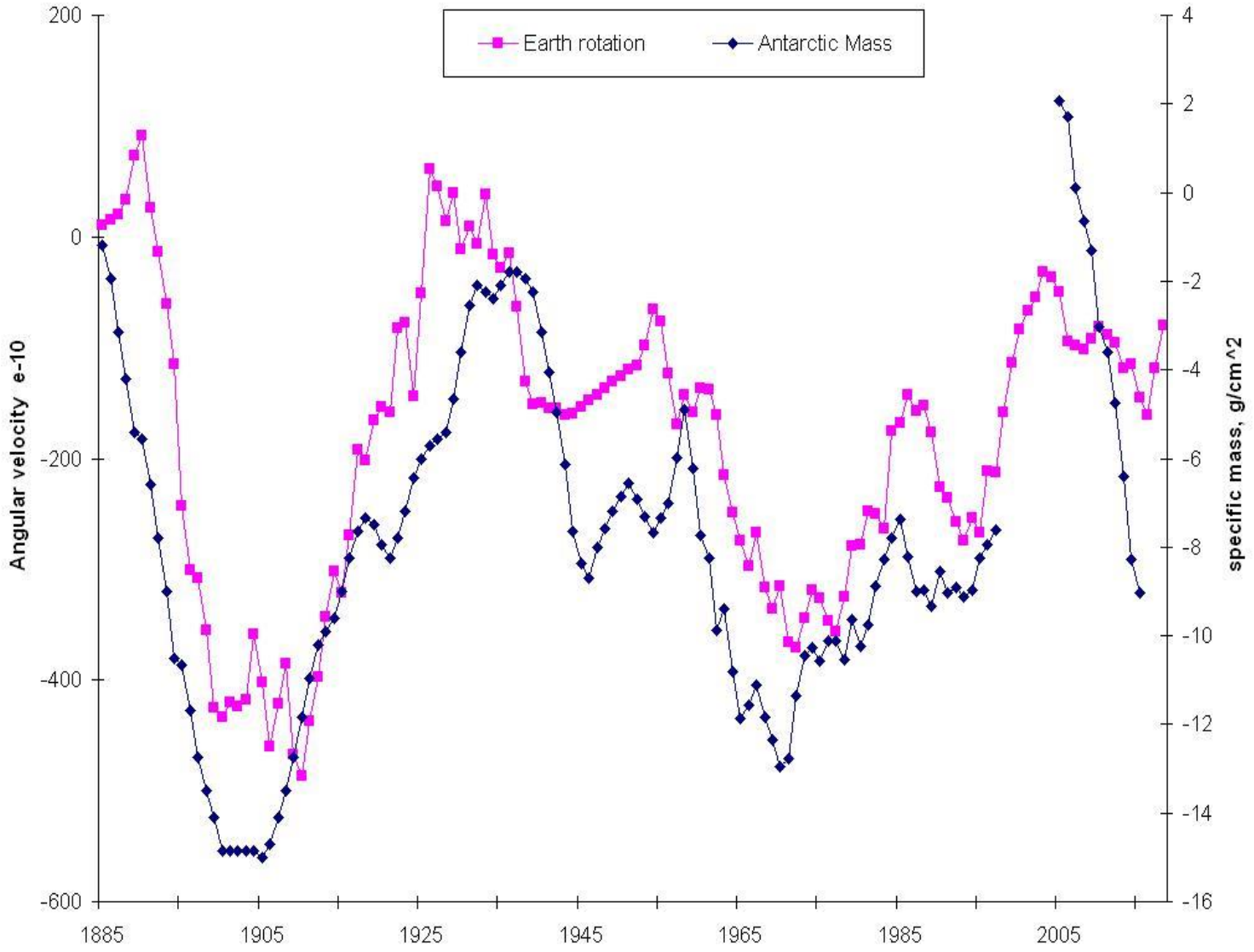
Figure 2.5 – Variation de masse spécifique moyenne sur le continent Grenland. En rose courbe théorique divisée par 4. En noir obtenue à l'aide des données du satellite GRACE



Synchronous changes in the length of day (blue curve) and the cumulative sum of anomalies of circulation form frequency C' (red curve)



Synchronous changes in the Earth's rotation angular velocity *v* (blue line) and of five year running anomalies of the Northern Hemisphere's air temperature after elimination of parabolic trend (black line). Original data from HadCRUT3. correlation coecient r = 0.67



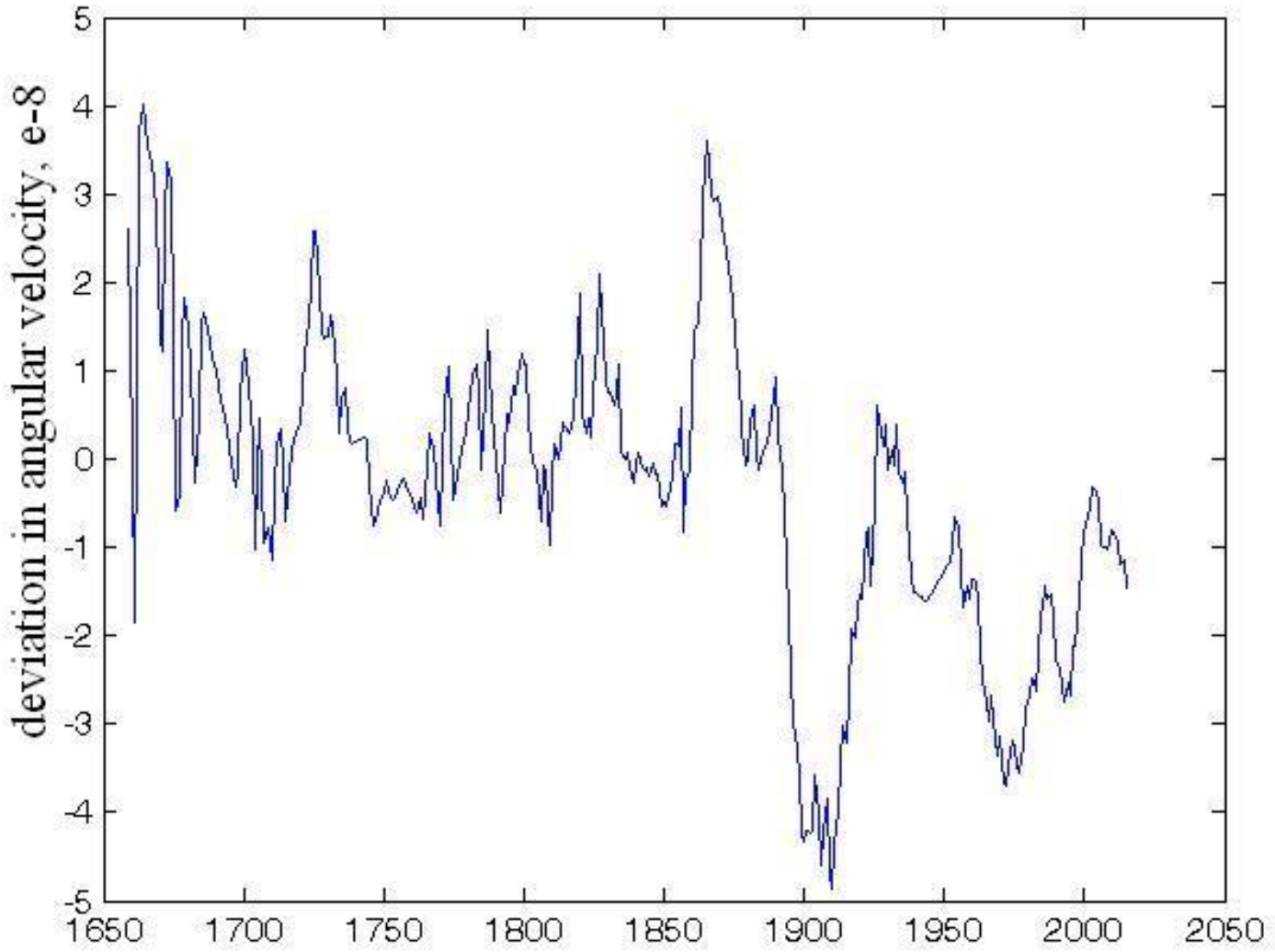
Temporal variations in the specific mass of ice in Antarctica and in the Earth's rotation angular velocity (r=0,85)

Summary

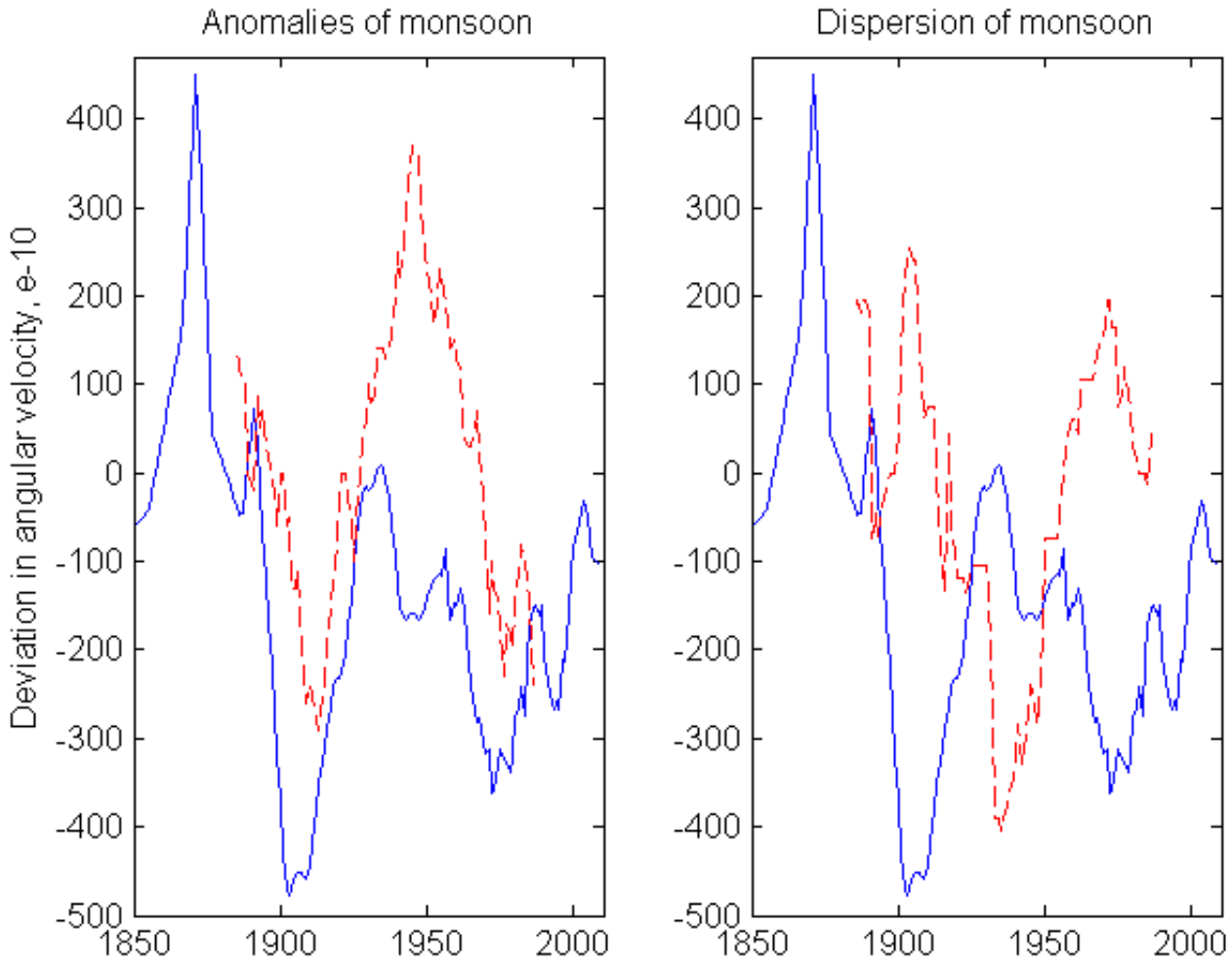
Thus, the research results and observations confirm the hypothesis about the movement of the lithosphere plates under the impact of the atmospheric and oceanic circulation on the decadal time scale.

The total effect of the movement of all lithosphere plates is interpreted by geophysics as the decadal fluctuations of the Earth rotation.

Thank you for your attention

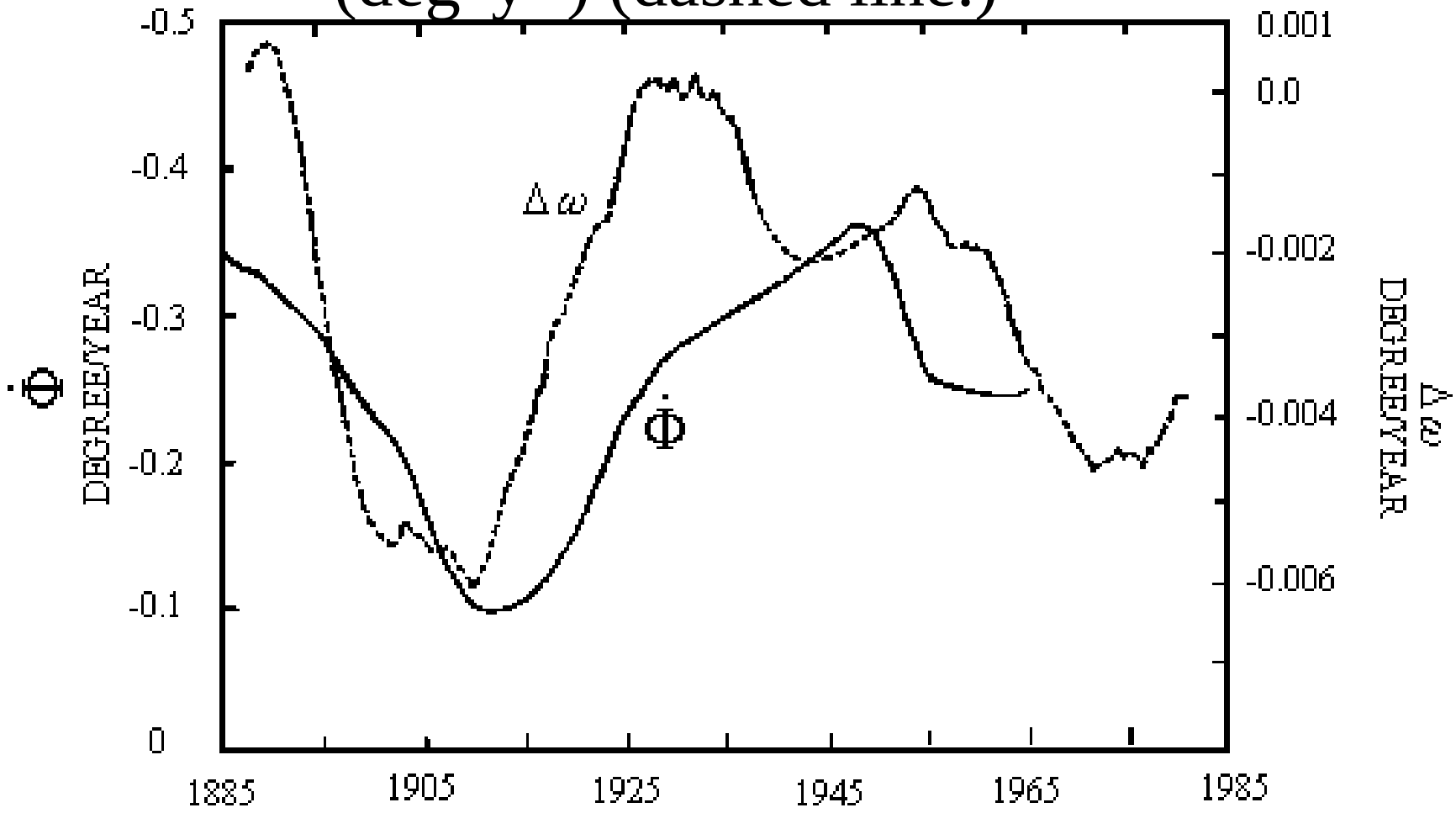


Changes in the drift velocity of the lithosphere over astenosphere



Synchronous changes in the Earth's rotational rate (solid curve), the anomalies (left) and dispersion (right) of the precipitation in the India monsoon (Rupa Kumar et al. 2004) (dashed curve).

Eccentric geomagnetic dipole motion (solid lines) and change in the length of day expressed as angular deviations of rotation (deg· y^{-1}) (dashed line.)



The sliding of the lithosphere over the asthenosphere is possible in the case when the action dueration is many times longer than the characteristic relaxation time *t*. For the asthenosphere relaxation time *t* equals from 10 day till 3000 year. However, this classical estimate does not take into account the effects of vibrational lithospheric displacements. Indeed, the lithospheric plates constantly vibrate in the vertical direction under the action of lunisolar tides. On the other hand, the lithospheric plates are constantly affected in the horizontal direction by shear stresses caused by friction of wind, and ocean currents. As a result, the lithospheric plates must exhibit vibrational displacements over the asthenosphere in the direction of acting tangential forces. There is abundant evidence supporting this plate drift.

Porphyries – where?

Under big volcanoes – over subduction zones – 'ring of fire'

W Americas, Philippines, Indonesia, PNG, Balkans/Iran/Pakistan

Most commonly Tertiary in age (<65 million years)