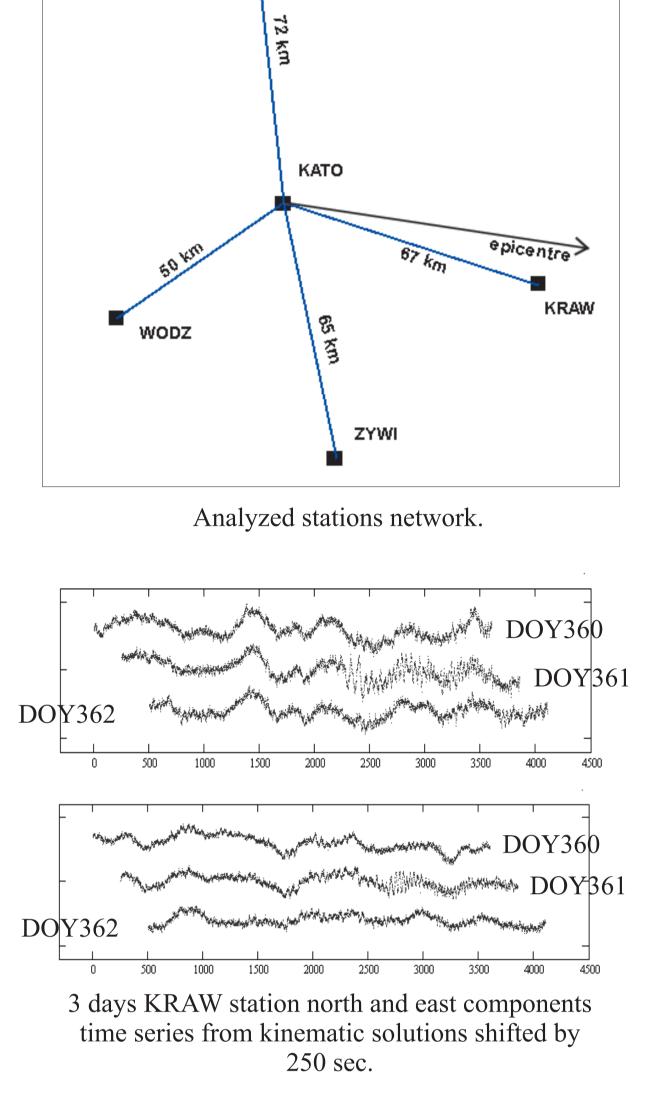
## **Time-frequency analysis of the Sumatra 2004 earthquake impact** on GPS stations displacements

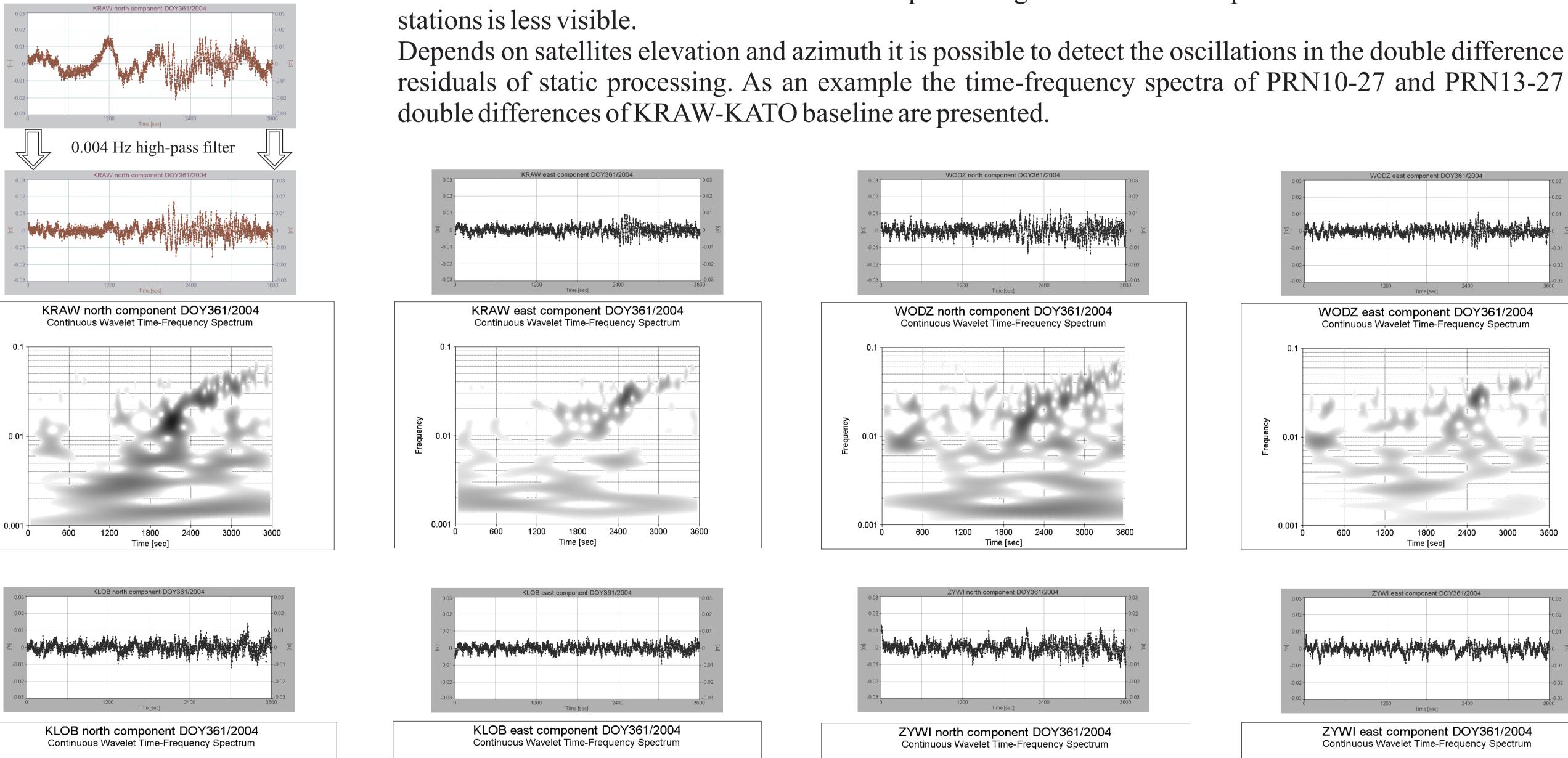
Jacek Kudrys

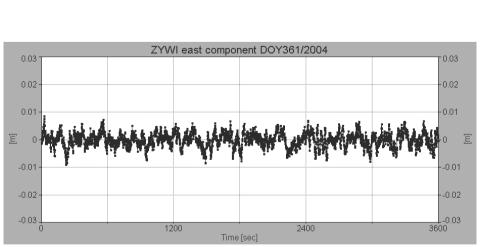
## AGH University of Mining and Metallurgy Faculty of Mining Surveying and Environmental Engineering Krakow, Poland

The Sumatra 26-12-2004 earthquake is one of the largest in the world since 1900. The magnitude was reported as 9.1 on the Richter scale. The earthquake sets off a tsunami recorded on tide gauges nearly worldwide (http://neic.usgs.gov/; http://wcatwc.arh.noaa.gov/). The earthquake lasted more then 8 minutes and it caused the entire Earth to vibrate. In this poster the observed impact of the earthquake on 5 Polish GPS stations is presented. Chosen stations (KATO, KRAW, ZYWI, WODZ, KLOB) are part of Polish Active Geodetic Network ASG-PL, and three of them (KATO, KRAW, ZYWI) provide data for EUREF Permanent Network. The stations are equipped with Ashtech UZ-12 receivers with ASH701945C M SNOW antennas and data are recorded with 1 sec sampling interval. All the stations are located on the roofs of the buildings. Analysis has been performed on the horizontal coordinates (north and east component) time series obtained from kinematic solution. In the kinematic processing the KATO station has been treated as a fixed station. Moreover the double difference residuals from baseline KRAW-KATO static solution have been also analyzed. The earthquake occurs at DOY361/2004 at 00:58:53 UT. To isolate the effect of earthquake on the GPS stations, 1-hour (1 UT - 2 UT) time series from 3 consecutive days DOY360, 361 and 362 have been compared. In the sample data from DOY361 the oscillations are visible; oscillations are not present day before an after. The day-to-day cross-correlation coefficient indicates a maximum correlation at lag of 250 sec. It indicates that the long term oscillations in the time series are satellites constellation dependent (e.g. multipath). To remove these oscillations from the signal the high-pass filter has been applied with 0.004 Hz arbitrary chosen frequency. The impact of Sumatra earthquake is clearly visible on the KRAW and WODZ spectra of north and east components. First oscillations in north component start at 1:33 UT and lasts about 20 minutes with frequency increasing from 0.015 Hz to 0.035 Hz. In the east component oscillations starts at 1:40 TU, lasts 6 minutes and frequency is between 0.020 Hz and 0.035 Hz. Due to baseline orientation nearly perpendicular to the seismic wave direction and differential processing of the data the impact on the ZYWI and KLOB stations is less visible.

KLOB







1800

Time [sec

3000

3600

المراجع والمحافظ والمحا

600

0.1

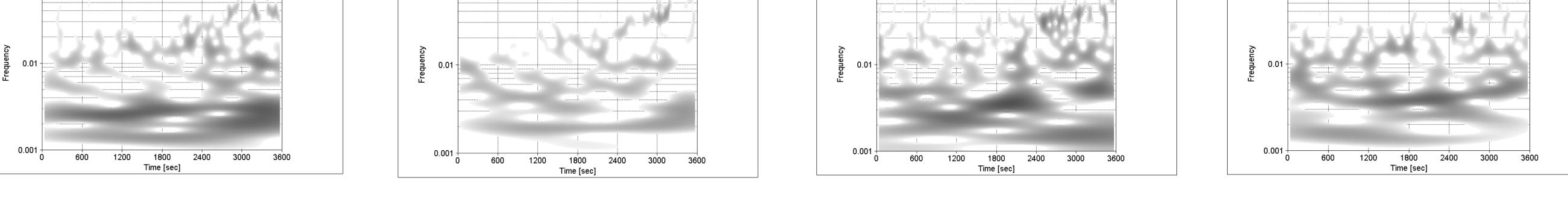
1200

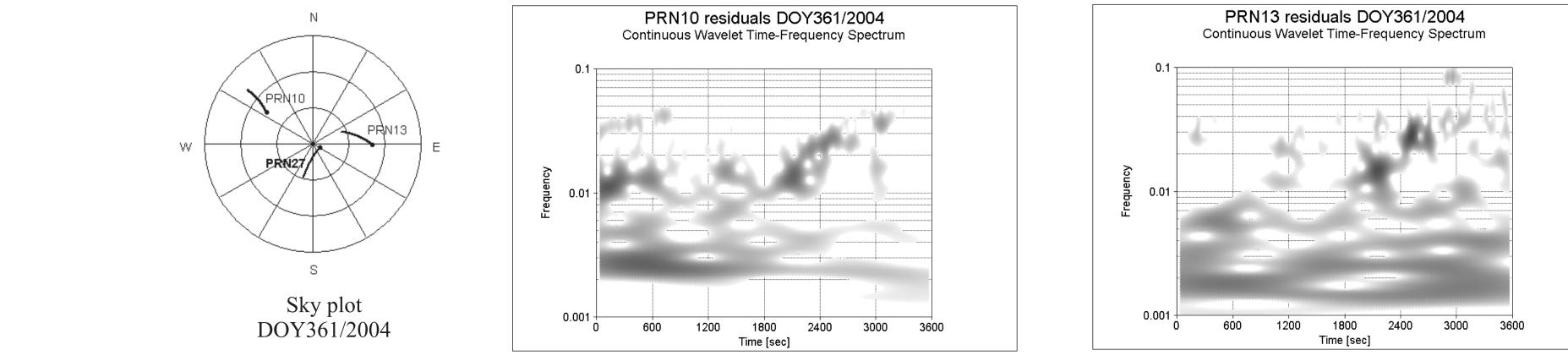
WODZ east component DOY361/2004

Continuous Wavelet Time-Frequency Spectrum

ZYWI east component DOY361/2004 Continuous Wavelet Time-Frequency Spectrum

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EUREF Symposium 2007 June 6-9, London, England