Quick comparison between WHOI and PSD sonic/motion systems deployed during STRATUS2011.

08/02/2011 – LB

1) Setup

A 10-m tower was set up on the 01 deck of the R/W Moana Wave (Figure 2). The PSD sonic anemometer and sonic anemometer were mounted on top of the tower, at heights above the water line of 15m and 14.2m respectively. The WHOI system was deployed on the jackstaff at a height above the water line of about 9.8m.

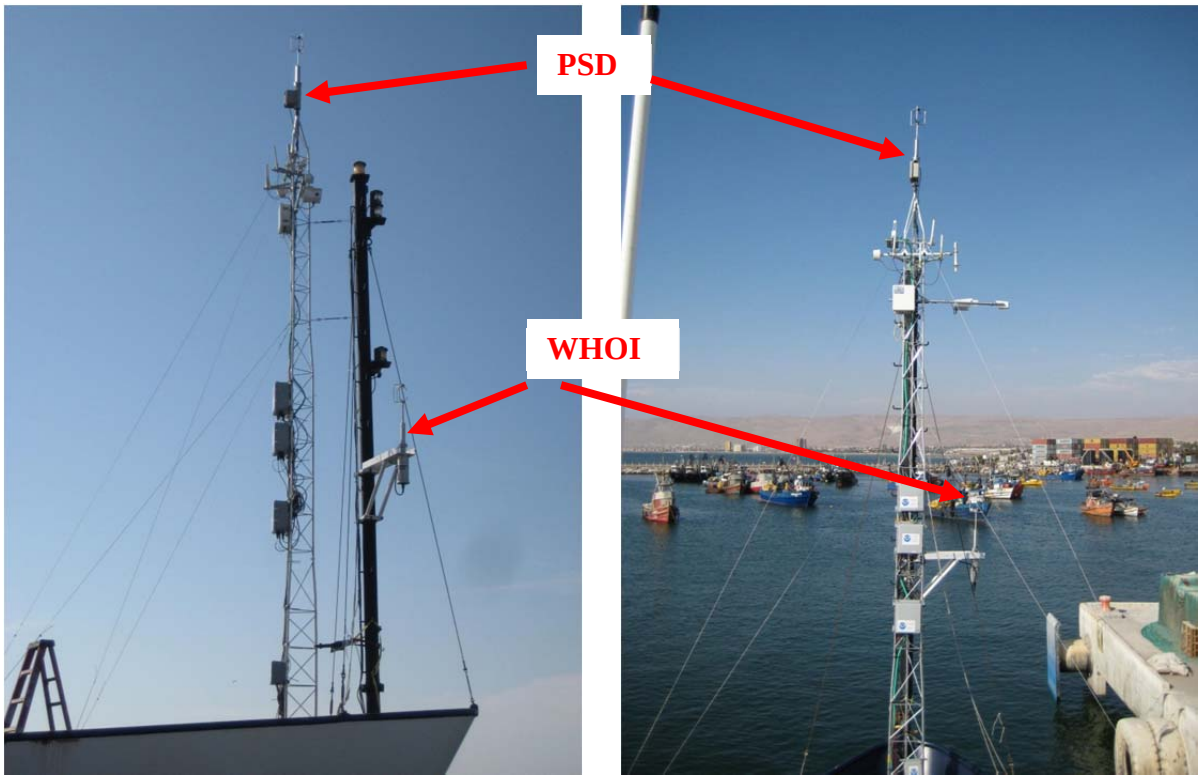

Figure 1. Views of the PSD flux tower and the jackstaff deployed on the R/V Moana Wave during STRATUS 2011.

2) Comparison

Day-Of-Year 91 (April 1, 2011), hour 01 was selected as a case study to compare both systems. The R/V Moana Wave set sail during that hour (Figure 2).

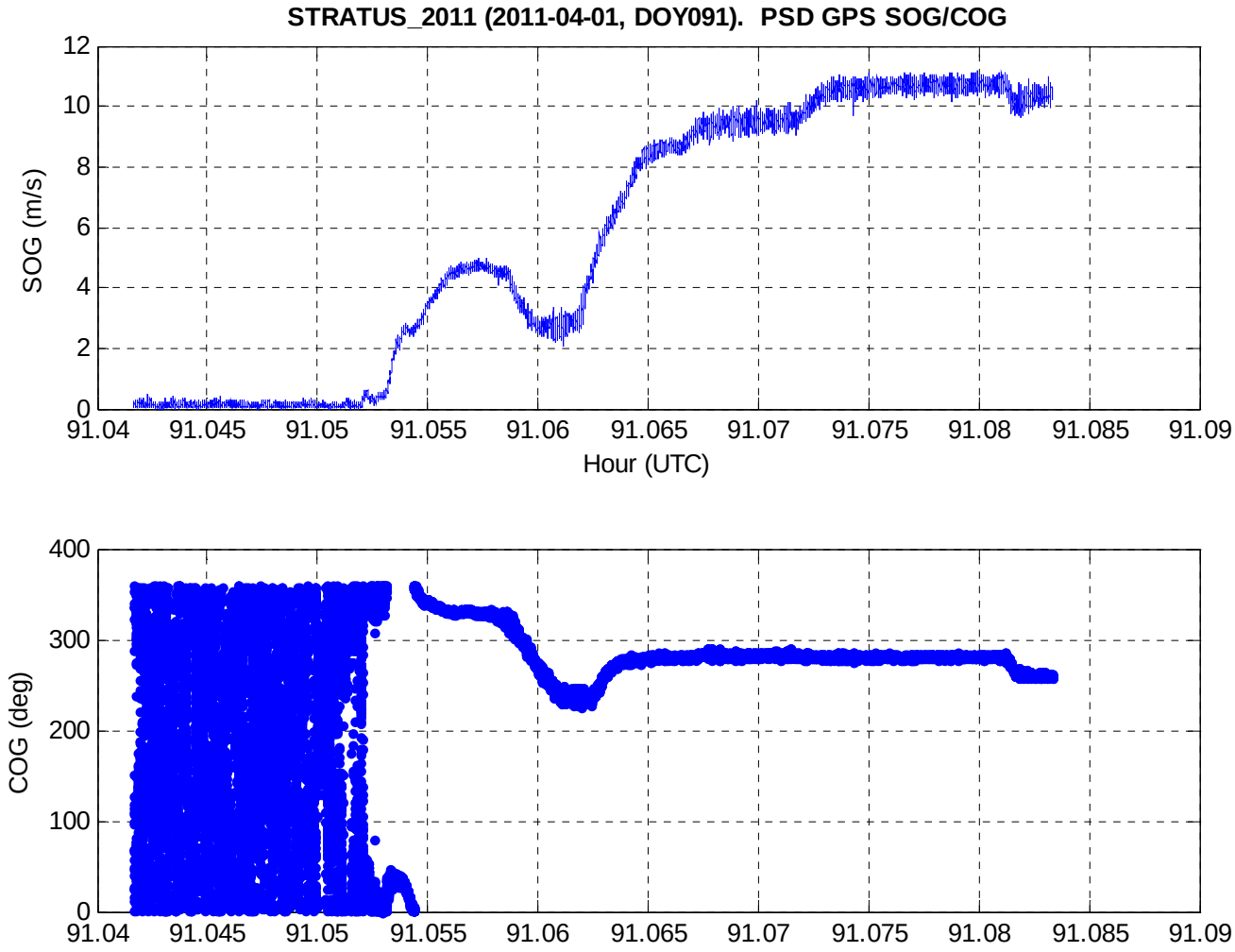

Figure 2. Speed (SOG) and Course Over-Ground (COG) of the R/V Moana Wave during DOY91, hour 01.

No height adjustments were done to compare the sonic anemometers. Due to the different heights and locations, differences are to be expected. Figure 3 displays the relative wind components as well as the temperature measured by both sonic instruments. The various signals track each other relatively well after correcting for time delays (~4 minutes here).

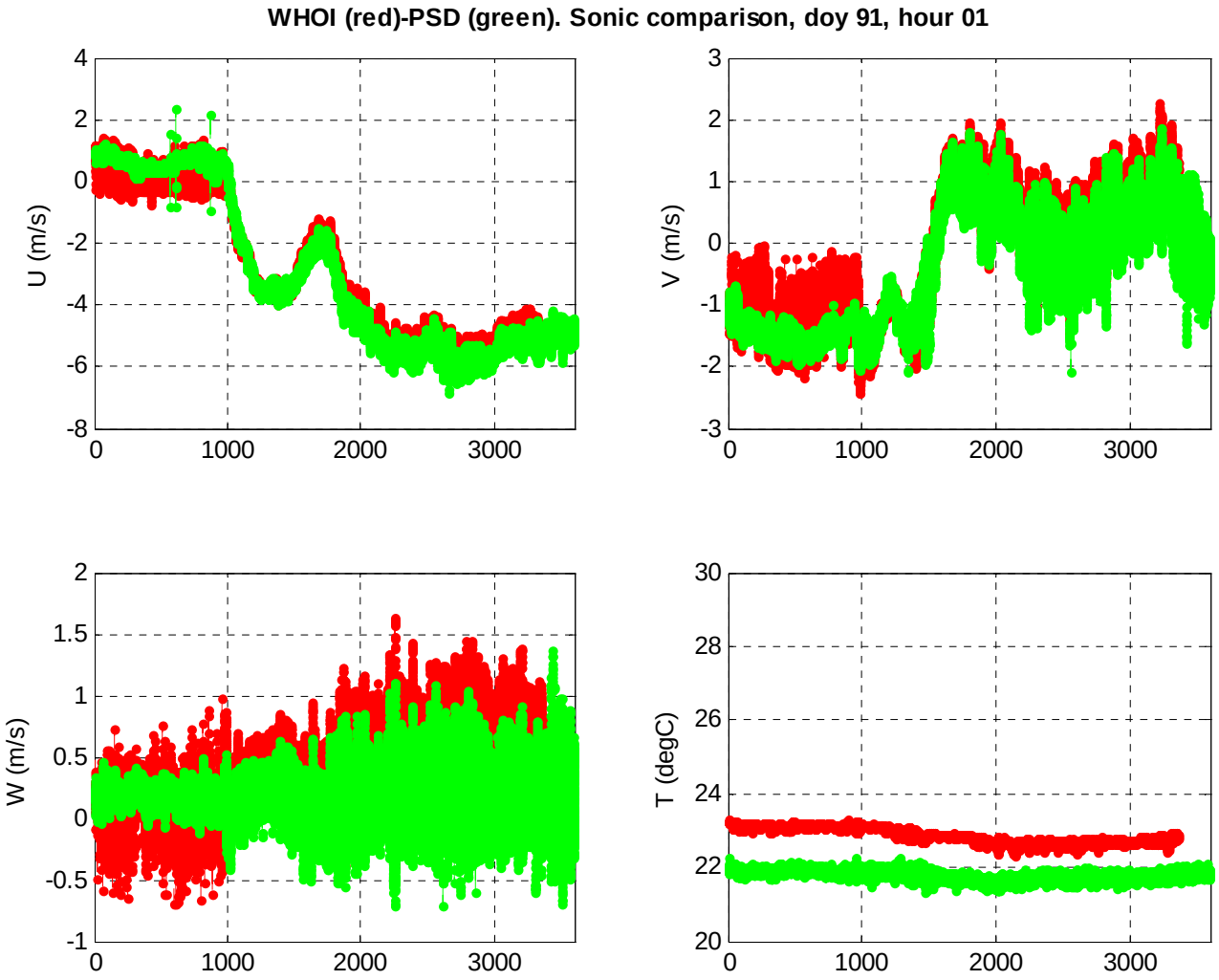

Figure 3. Time series of relative wind components and temperatures between the PSD and WHOI sonic anemometers.

As angular rates are measured in the same referential (the ship's frame) we can directly compare the two motion systems. Figures 4, 5 and 6 shows comparisons for the pitch, roll, and yaw rates. One can see that the roll rates are in very good agreement (Figure 4), while there is a slight offset between PSD and WHOI regarding the pitch rate (Figure 5). The PSD yaw rate presents a lot of noise when compare to the WHOI unit (Figure 6). This could be due to our filters and will need to be checked.

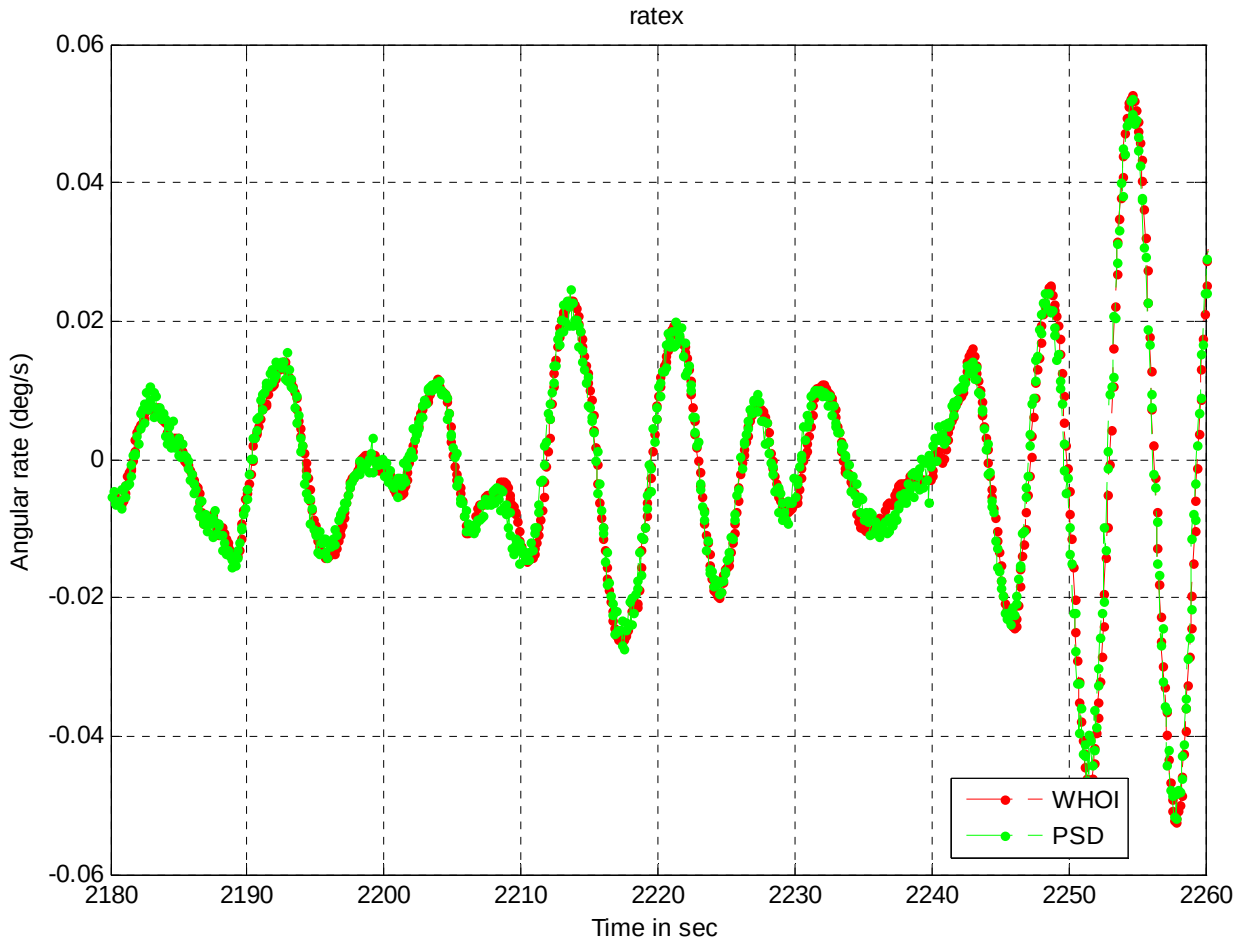

Figure 4. Time series of roll rates.

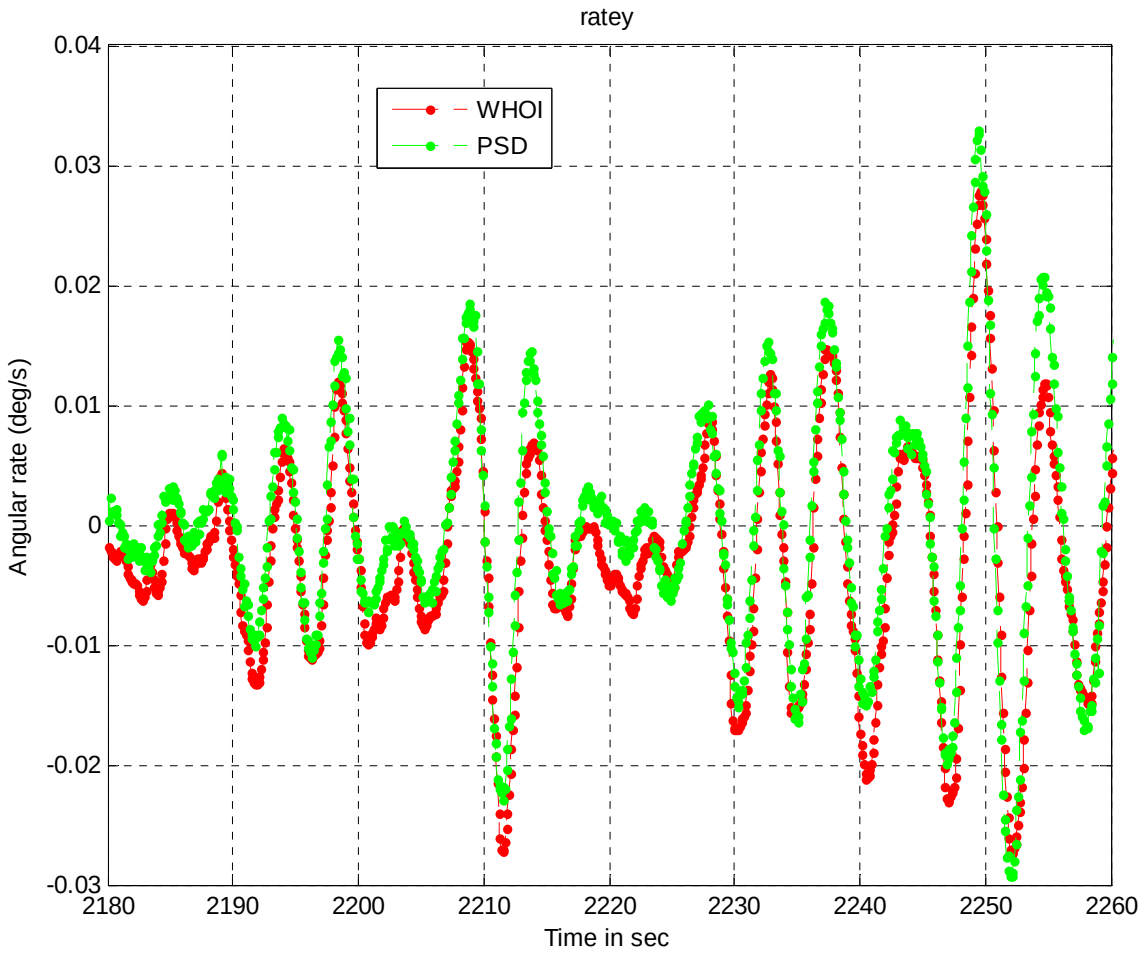

Figure 5. Time series of pitch rates.

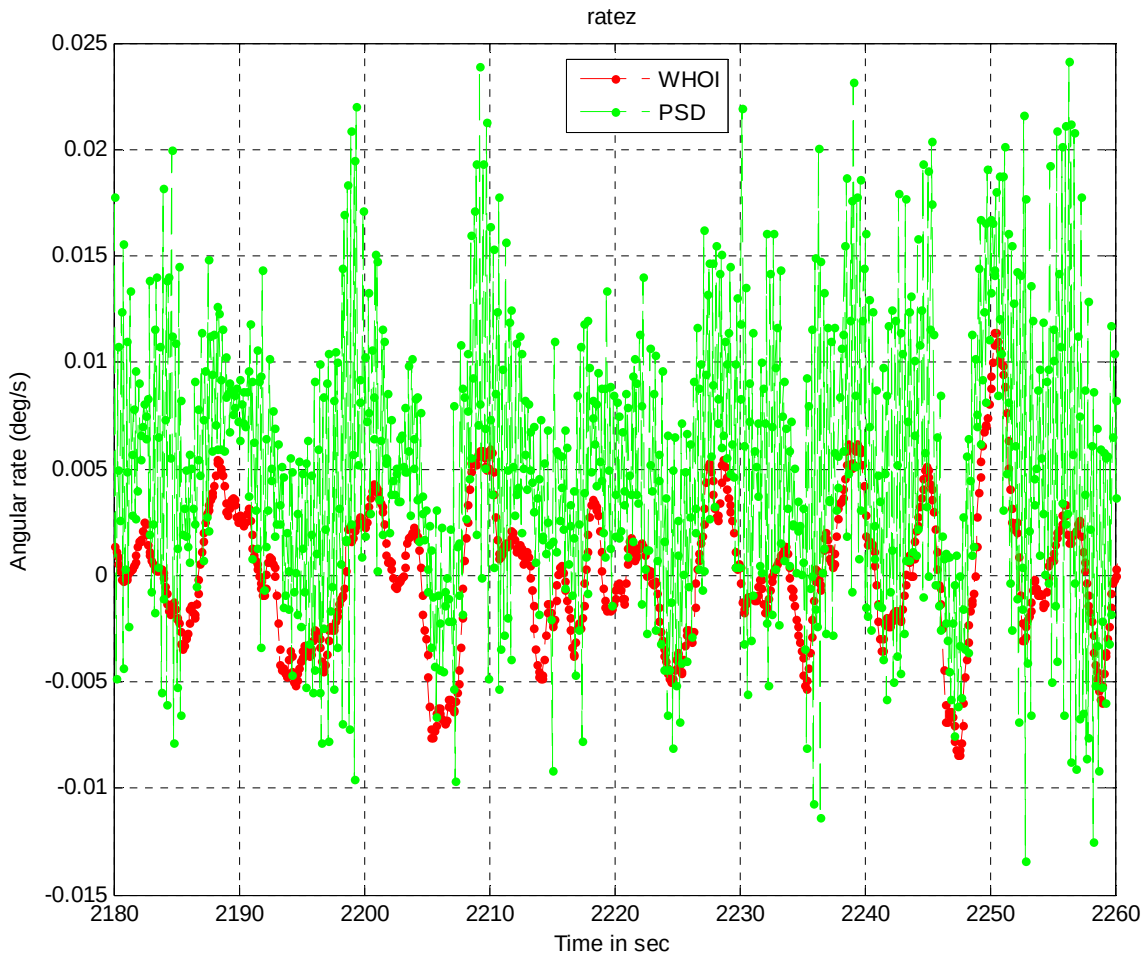

Figure 6. Time series of yaw rates.

Because of the different heights, locations, and leveling, differences between accelerations measured by PSD and WHOI are likely. Figures 7, 8 and 9 show that accelerations of PSD and WHOI systems track each other relatively well. The acceleration offsets will mostly result in a difference in the computed roll and pitch angles. For that example, a difference of about 0.6 degrees was found for the angles betwwen PSD and WHOI systems

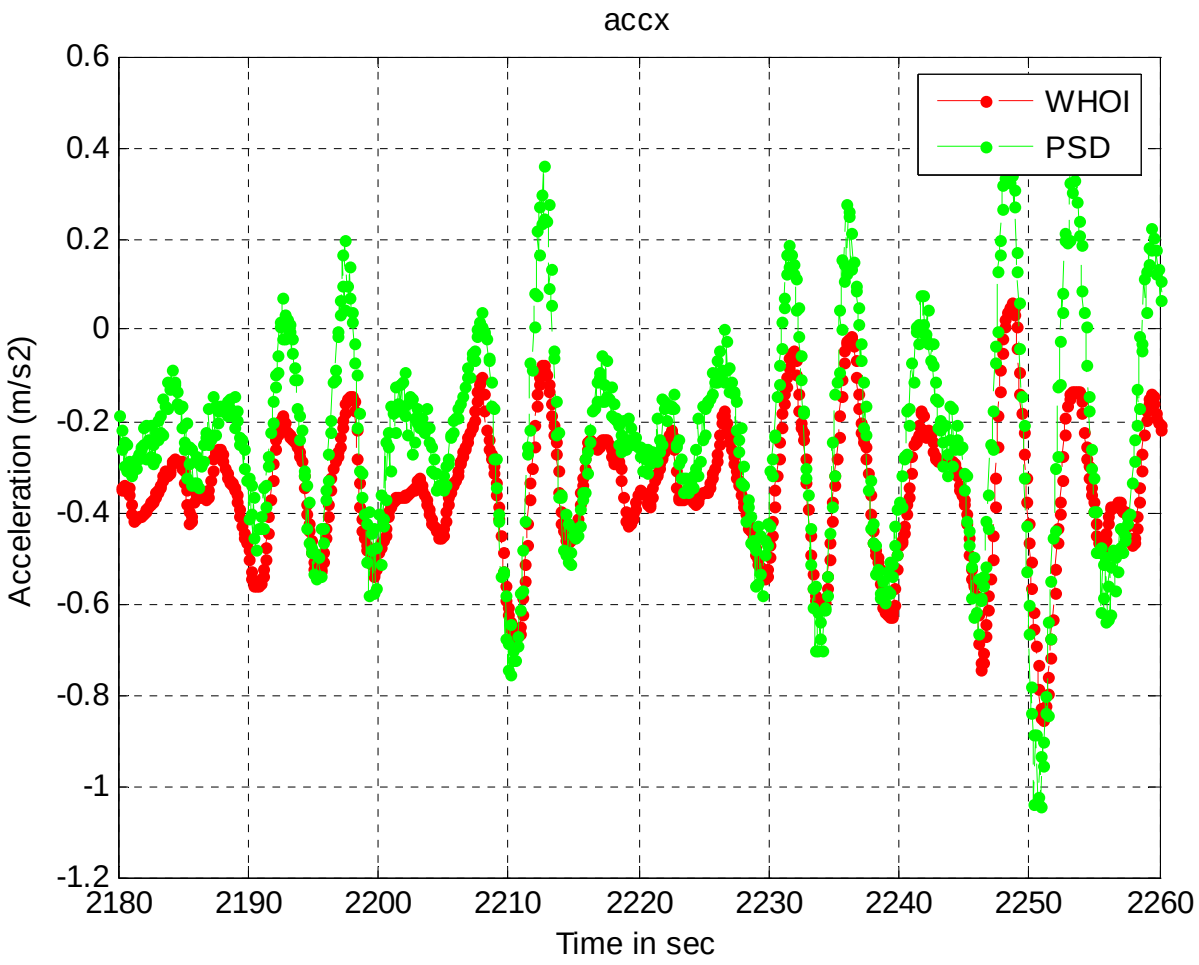

Figure 7. Time series of acceleration in the x-axis.

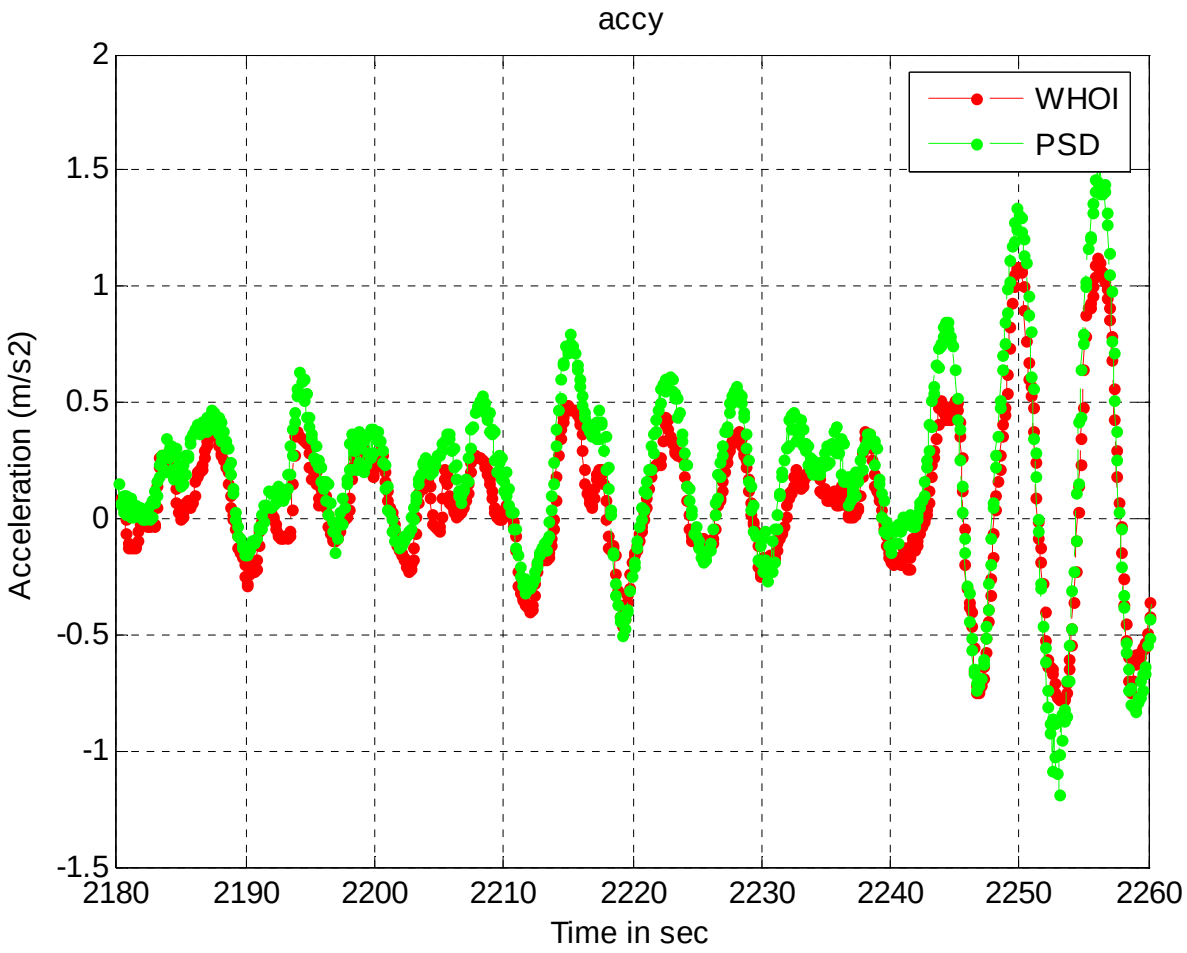

Figure 7. Time series of acceleration in the y-axis.

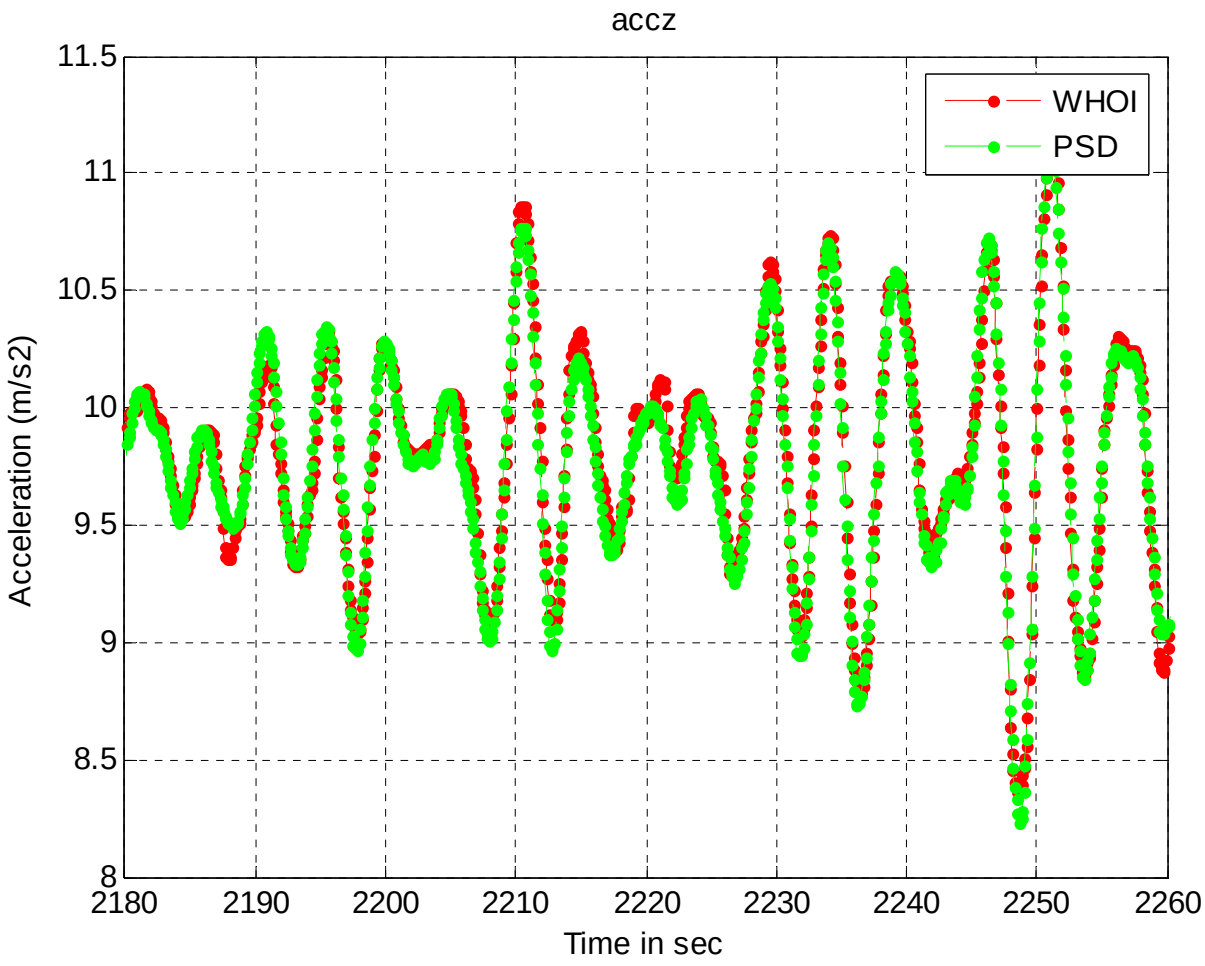

Figure 7. Time series of vertical acceleration.

Finally, the motion correction algorithm applied on both systems yield similar true wind components. As an illustration, figure 8 shows time series of the vertical wind speed after motion correction applied on both PSD and WHOI systems.

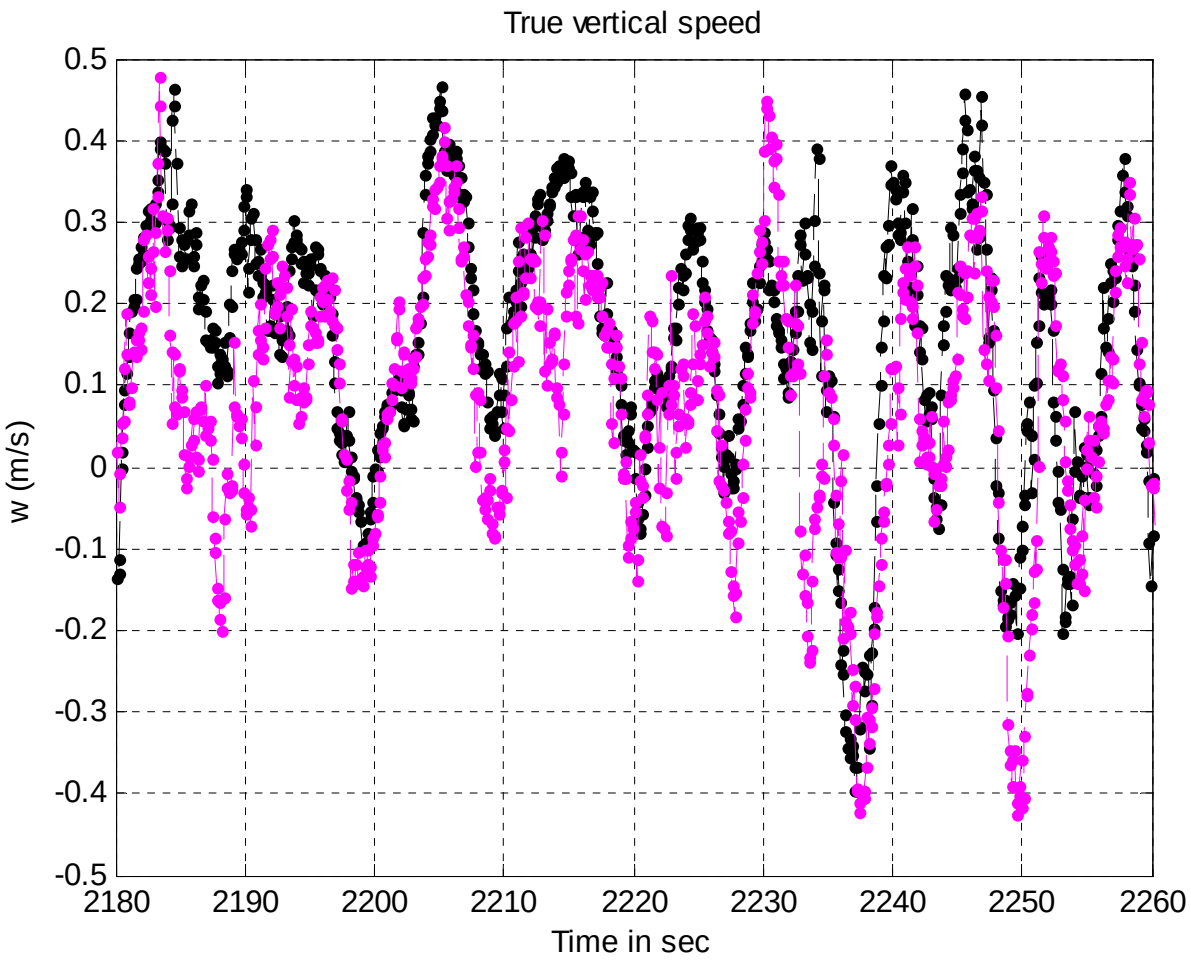

Figure 8. Time series of corrected vertical wind speed w.