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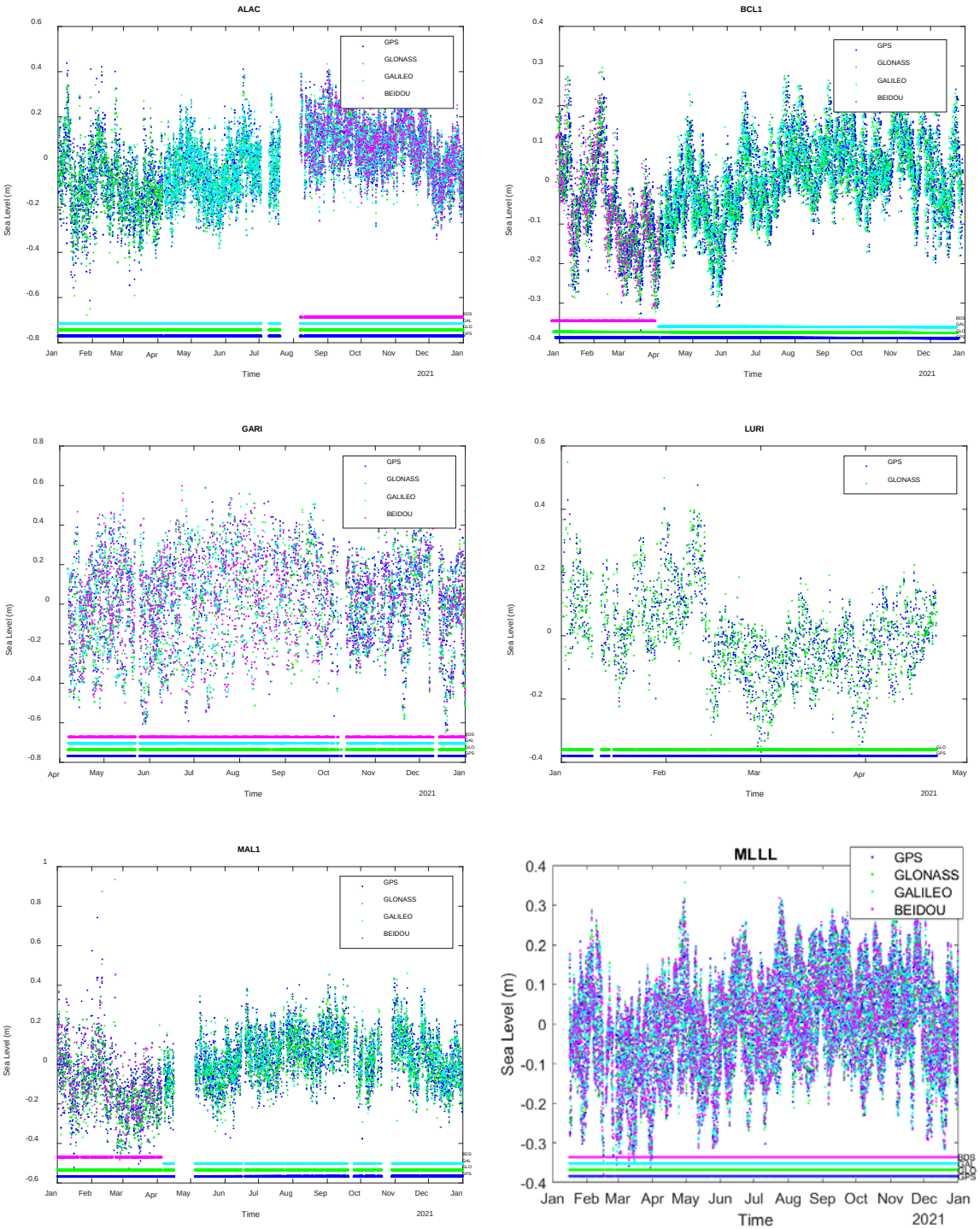
ORIGINAL RESEARCH ARTICLE

GNSS-Interferometric Reflectometry, spectral artifacts and sea level measurements in the Mediterranean Sea

Supplementary file



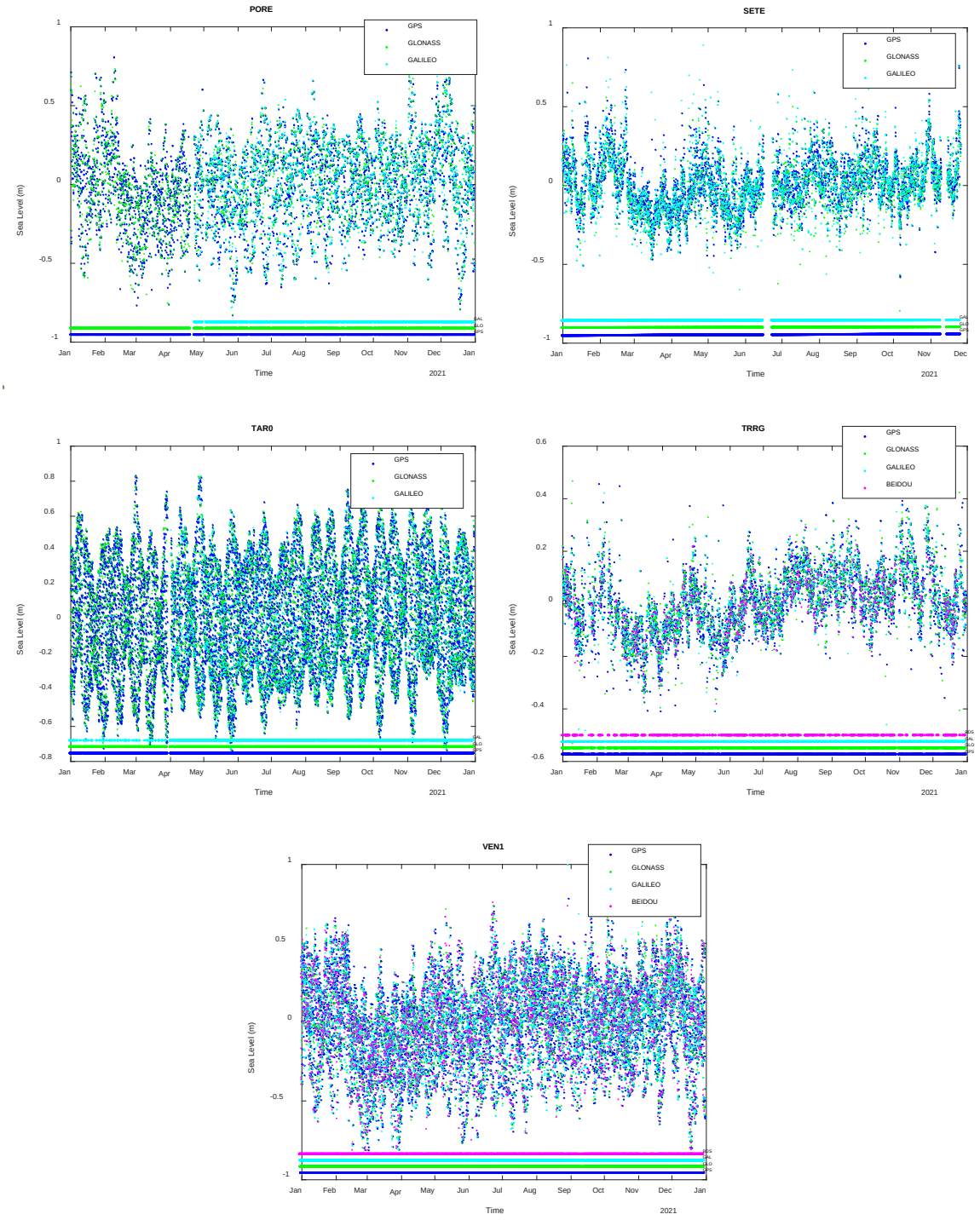
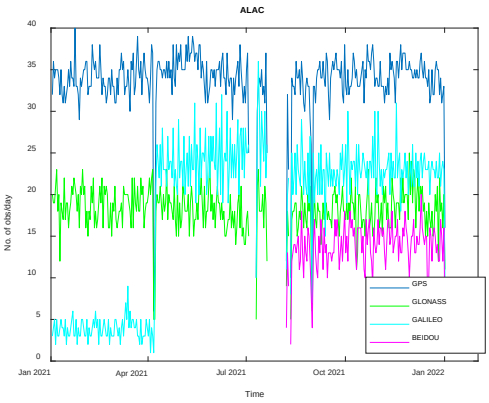
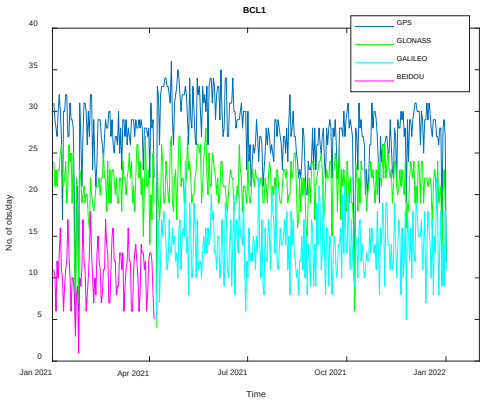
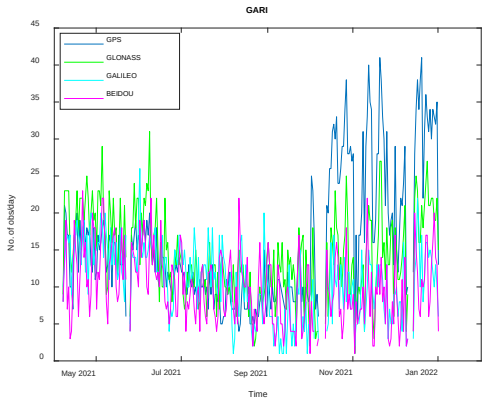
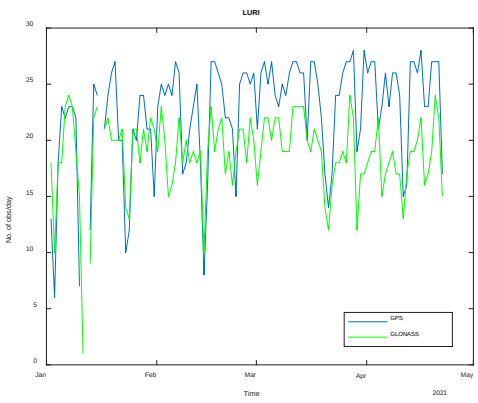


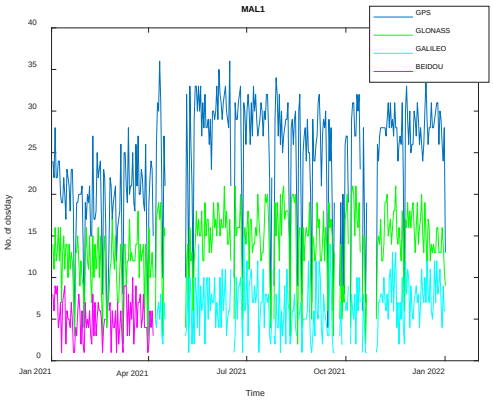
Figure 1S. Sea level variations estimated from GNSS Interferometric Reflections at 11 stations located in the Mediterranean region. Sea level is estimated using reflected signals originated from different satellite constellations (see colors in legend). Time spans cover approximately one year. Color bars shown on the abscissa of the graphs denote the constellation used for sea level determinations.

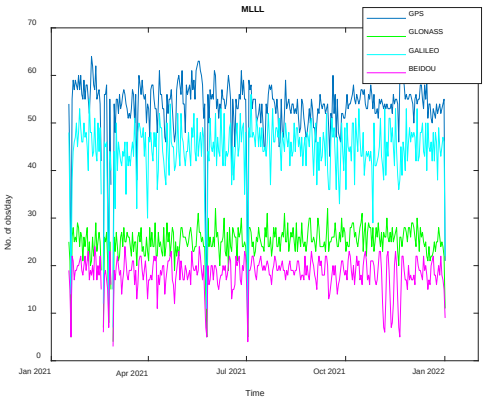

ALAC
No. of obs/day
Time
GPS
GLONASS
GALILEO
BEIDOU
Jan 2021
Apr 2021
Jul 2021
Oct 2021
Jan 2022

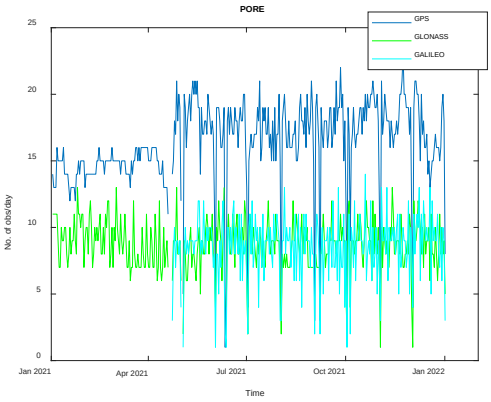

BCL1
No. of obs/day
Time
GPS
GLONASS
GALILEO
BEIDOU
Jan 2021
Apr 2021
Jul 2021
Oct 2021
Jan 2022

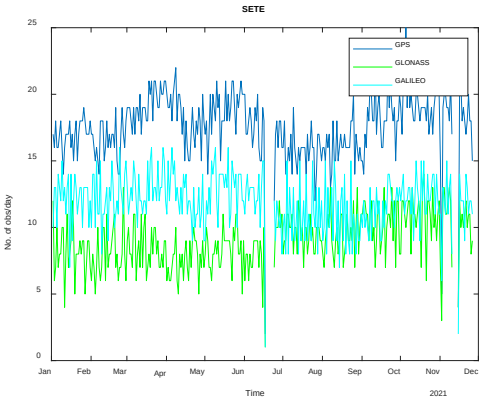

GARI
No. of obs/day
Time
GPS
GLONASS
GALILEO
BEIDOU
May 2021
Jul 2021
Sep 2021
Nov 2021
Jan 2022


LURI
No. of obs/day
Time
GPS
GLONASS
Jan
Feb
Mar
Apr
May
2021


MAL1
No. of obs/day
Time
GPS
GLONASS
GALILEO
BEIDOU
Jan 2021
Apr 2021
Jul 2021
Oct 2021
Jan 2022


MLLL
No. of obs/day
Time
GPS
GLONASS
GALILEO
BEIDOU
Jan 2021
Apr 2021
Jul 2021
Oct 2021
Jan 2022


PORE
No. of obs/day
Time
GPS
GLONASS
GALILEO
Jan 2021
Apr 2021
Jul 2021
Oct 2021
Jan 2022


SETE
No. of obs/day
Time
GPS
GLONASS
GALILEO
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2021

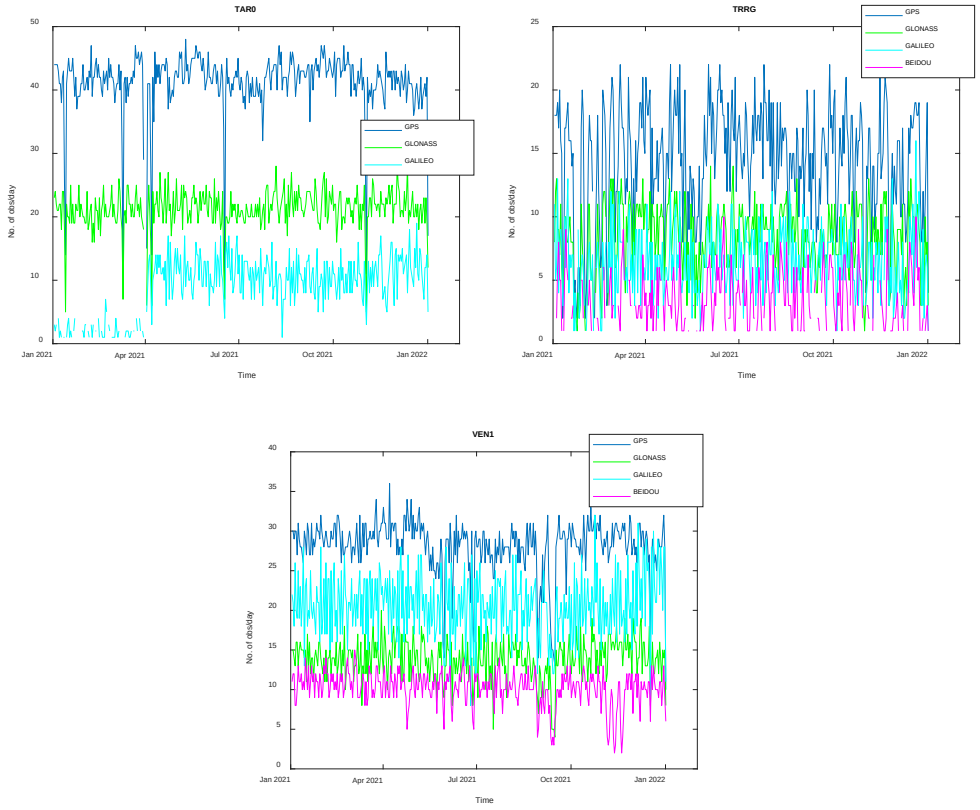


Figure 2S. Same stations as in **Figure 1S**, number of Sea Level observations per day (obs/day) as a function of time and for different satellite constellations (see colors in legend). GNSS reflections are not always available because of receiver configurations, reduction of sea visibility or disturbing factors due to harbor activities and marine traffic.

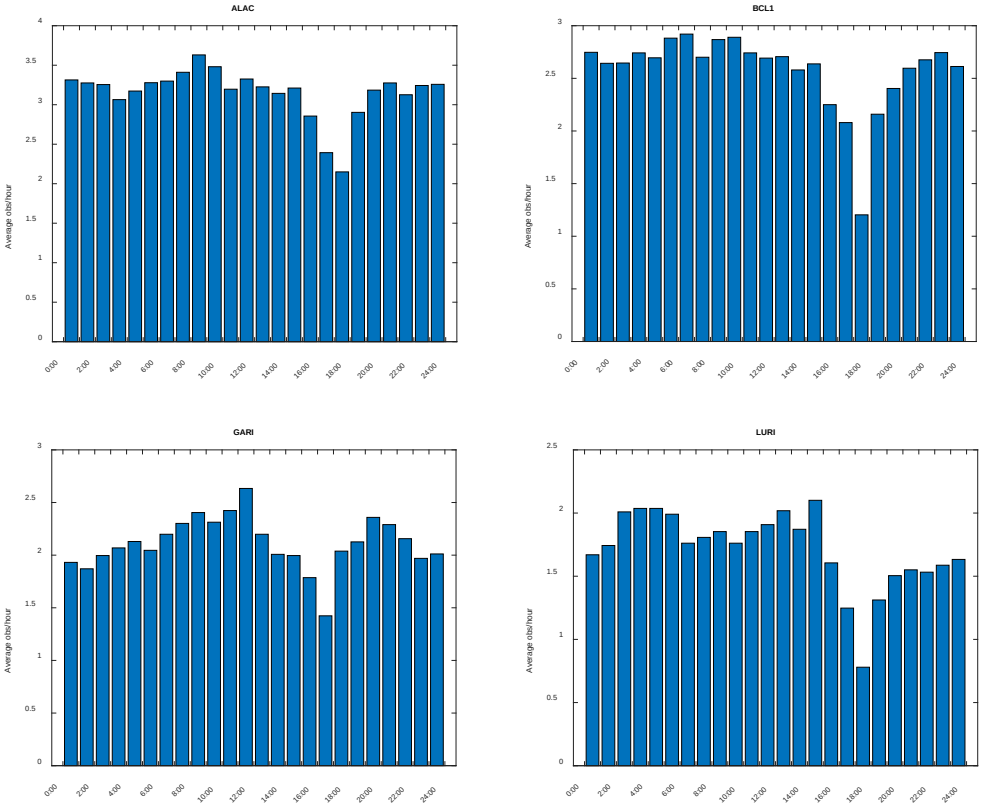
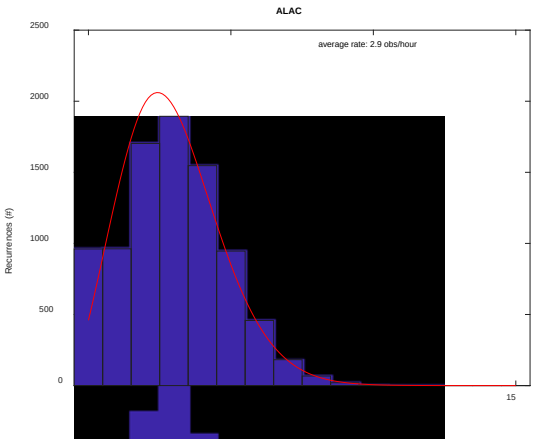
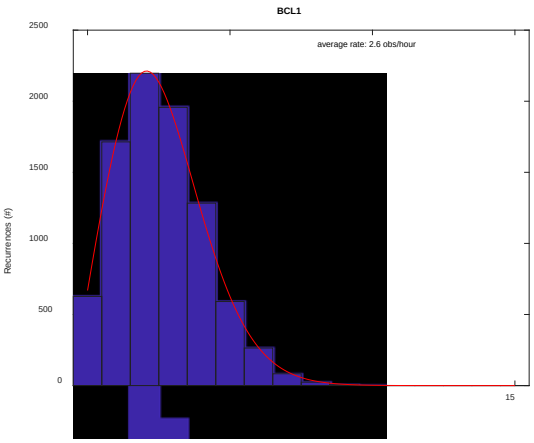
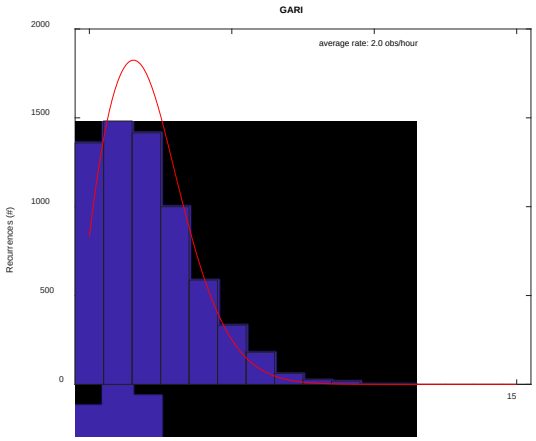
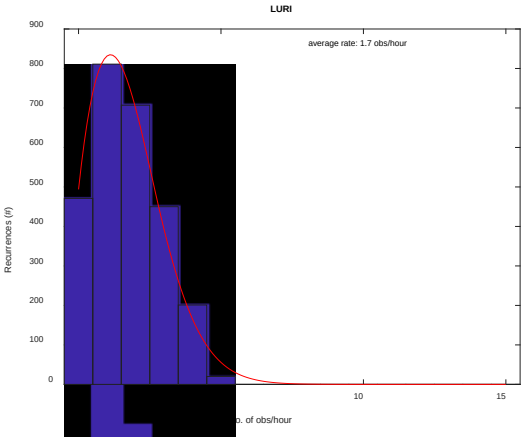


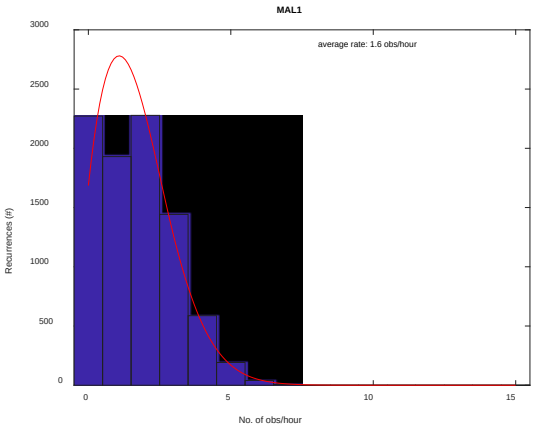
Figure 3S. Same stations as in **Figure 1S**, the number of sea level observations per hour (obs/hour) averaged over all satellite constellations and stacked over all hours of a day. This parameter shows the average rate of sea level observations over a 24 hour time span.

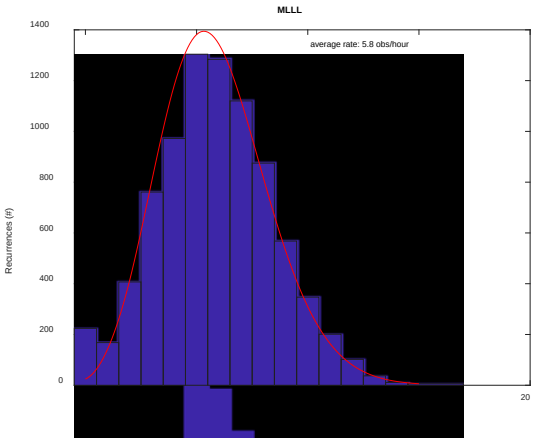

ALAC
average rate: 2.9 obs/hour
Recurrences (#)
2500
2000
1500
1000
500
0
15

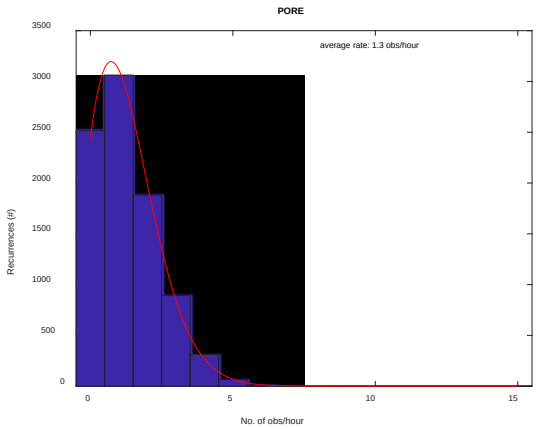

BCL1
average rate: 2.6 obs/hour
Recurrences (#)
2500
2000
1500
1000
500
0
15

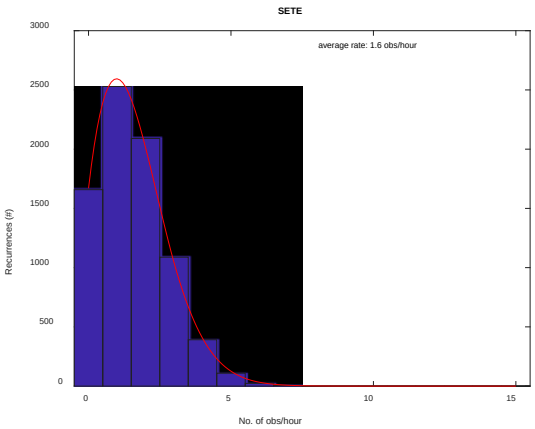

GARI
average rate: 2.0 obs/hour
Recurrences (#)
2000
1500
1000
500
0
15


LURI
average rate: 1.7 obs/hour
Recurrences (#)
900
800
700
600
500
400
300
200
100
0
10
15


MAL1
average rate: 1.6 obs/hour
Recurrences (#)
3000
2500
2000
1500
1000
500
0
0
5
10
15
No. of obs/hour


MLLL
average rate: 5.8 obs/hour
Recurrences (#)
1400
1200
1000
800
600
400
200
0
20


PORE
average rate: 1.3 obs/hour
Recurrences (#)
3500
3000
2500
2000
1500
1000
500
0
0
5
10
15
No. of obs/hour


SETE
average rate: 1.6 obs/hour
Recurrences (#)
3000
2500
2000
1500
1000
500
0
0
5
10
15
No. of obs/hour

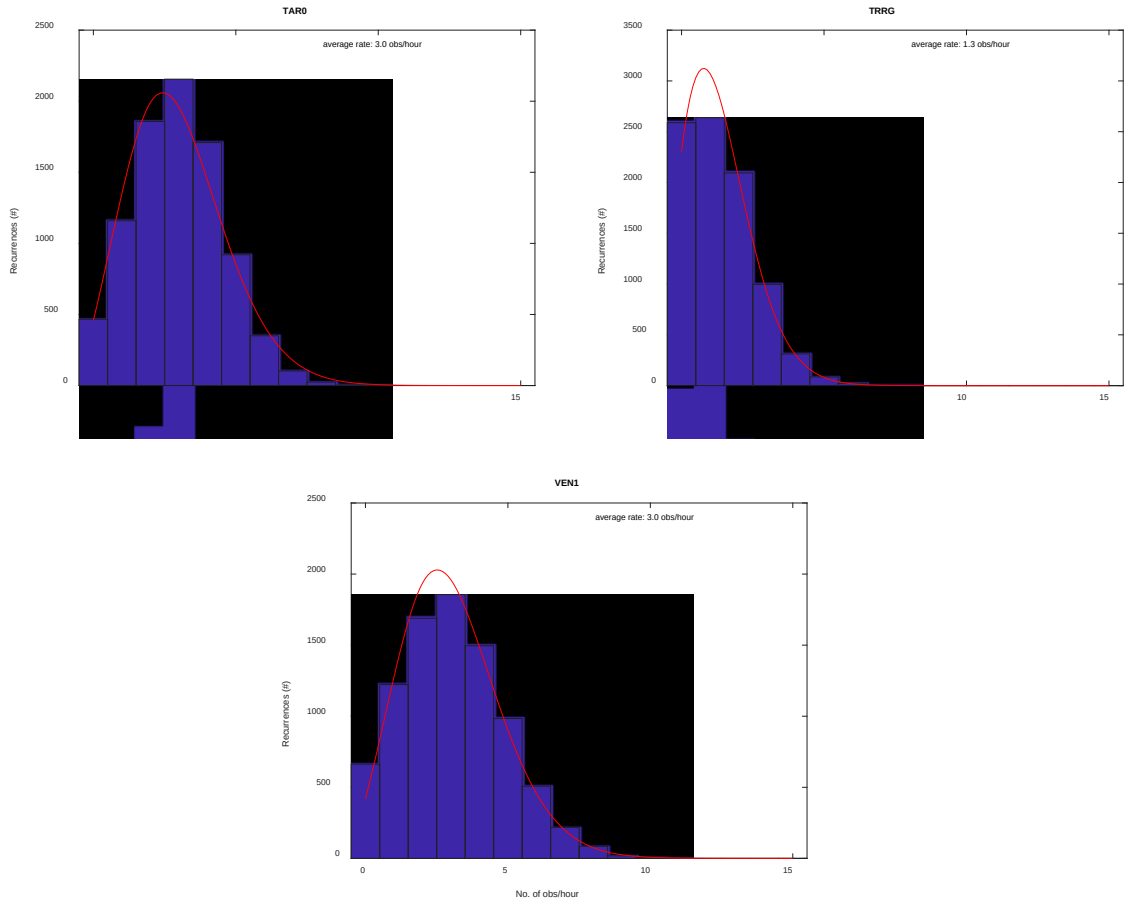
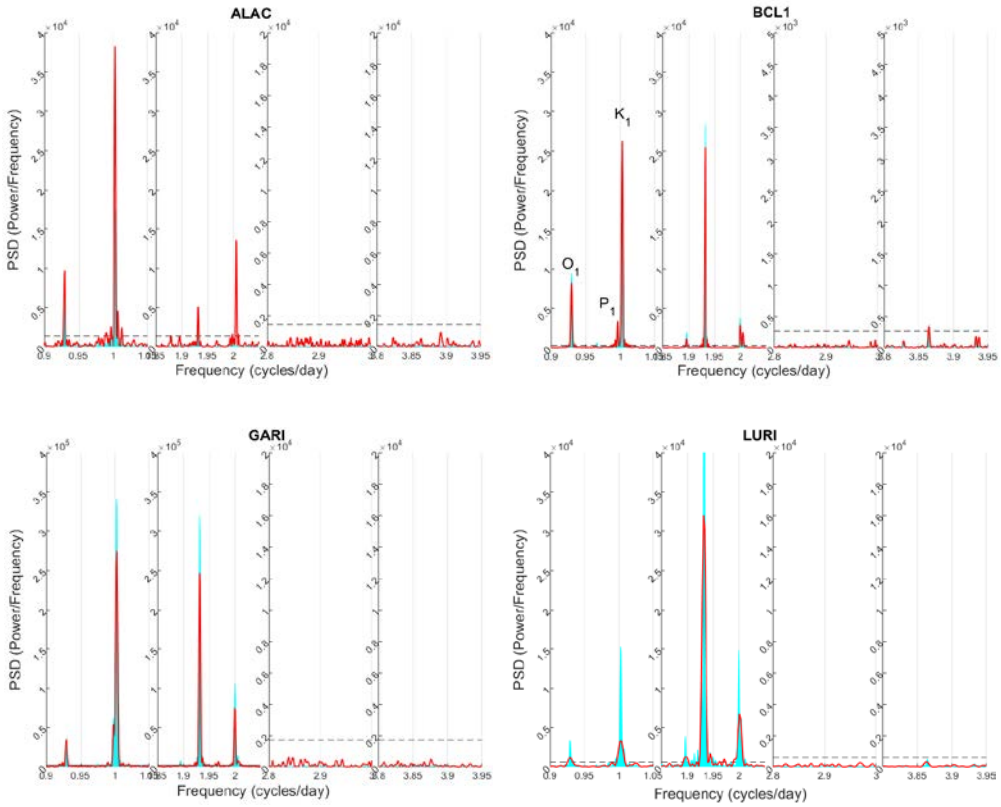


Figure 4S. Same stations as in Figure 1S, histogram of the distribution of number of sea level observations per hour (obs/hour) in the entire observation span. The red line represents the ideal Poisson distribution with the estimated average rate.



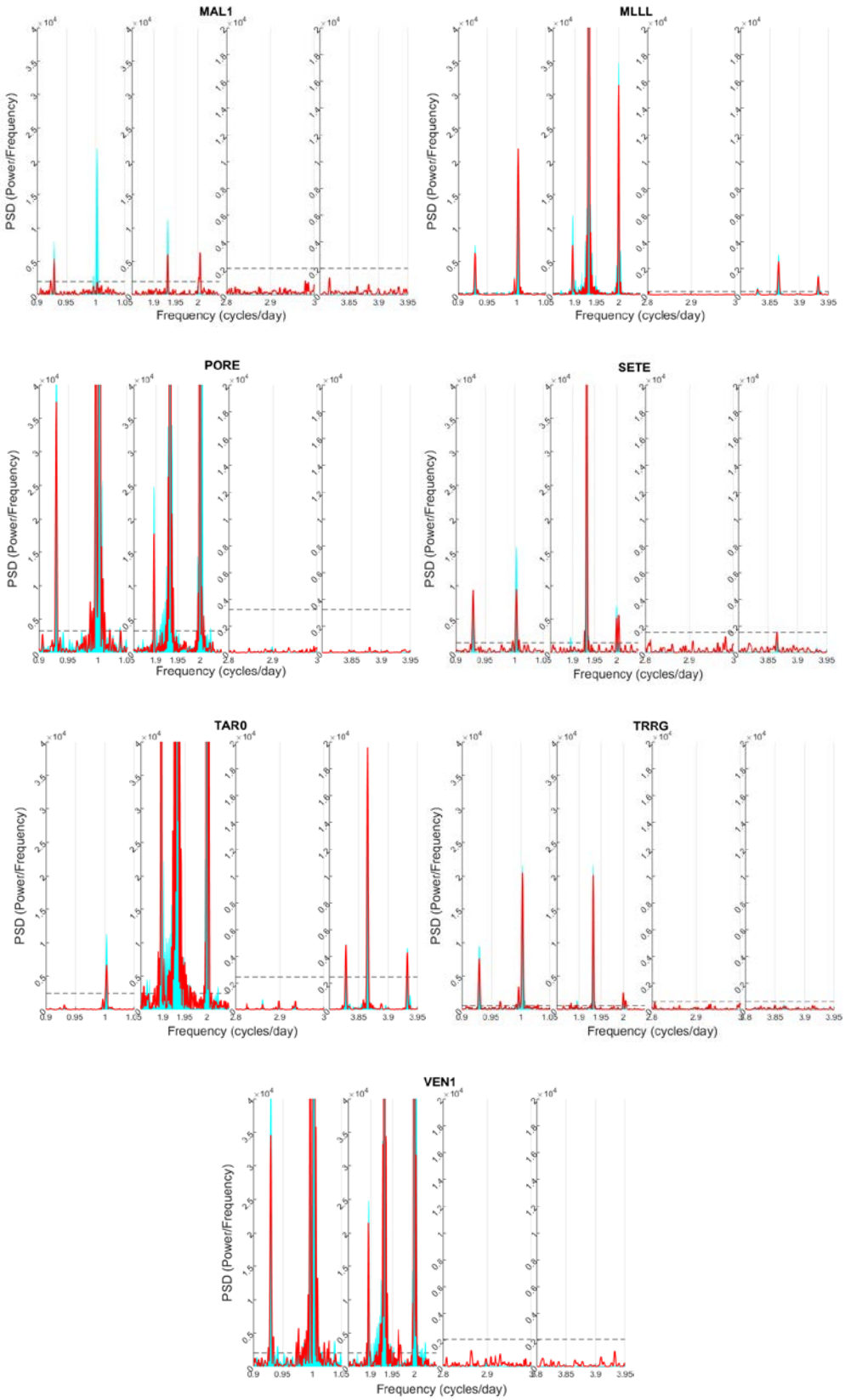


Figure 5S. Same stations as in **Figure 1S**, spectra of sea level determinations compared to spectra obtained from tide gauge data. Panels from left to right of each plot show tidal frequencies in the diurnal, semidiurnal, terdiurnal and quarter diurnal windows. Red line refers to the GNSS data and cyan line to the tide gauge data. The horizontal dashed line represents the 1% confidence level of the spectral amplitudes.