Form #5
Prepared By: Kasey Aderhold

Status: ☒ In progress ☐ Completed

Question from the Community

Name	Doug Wiens		
Date of Contact	7/25/16		
Date of Contact	7/27/16	Completion date	
Experiment	Mariana 2012		
IIC Affected & Contact	LDEO		
Stations Affected	All LDEO stations		
Contact Information	Doug Wiens, doug@wustl.edu Chen Cai, caichenixt@gmail.com		

Summary:

When using the LDEO Mariana data for surface wave tomography, Chen Cai has been removing the instrument responses using those available at the DMC. After removal, the amplitudes of the LDEO OBS are 4-10 times larger than the amplitudes of adjacent SIO OBS and land broadband stations. The amplitude different does not vary significantly with period, so likely gain is the problem not poles and zeros.

Previously concluded that the gain was set too high for the Marianas experiment after seeing clipping of recordings of small earthquakes.

The 2012-2013 Mariana gains are the same for the 2009-2010 Lau experiment.

Steps Taken:

Date	Action
7/25	Doug contacts LDEO, OMO.
7/27	Kasey requests any plots or additional information.
7/28	Doug forwards request to Chen.
7/29	Chen sends amplitude comparison plots.
7/29	Doug follows up with additional information.
8/26	Doug and Kasey discussed in person briefly at IRIS.
11/14	Kasey summarizes with additional plots.
12/8	E-mail sent to Andrew about open issue.
2/1	E-mail sent to Andrew about open issue.
4/10	In person chat with Doug Wiens about open issues.
4/19	E-mail sent to Andrew about open issue.
5/1	E-mail sent to Andrew about open issue.

Amplitudes of fundamental Rayleigh waves (30s to 70s) from various earthquakes recorded by B08L and other LDEO stations, land stations, and SIO OBS.

From Chen in 7/29/16 e-mail: "*For longer period, local structure should only have minor effect on the amplitudes. From the plots, it seems that each LDEO station has its own gain.*"

Figure 1. a) B08L and other LDEO OBS stations:

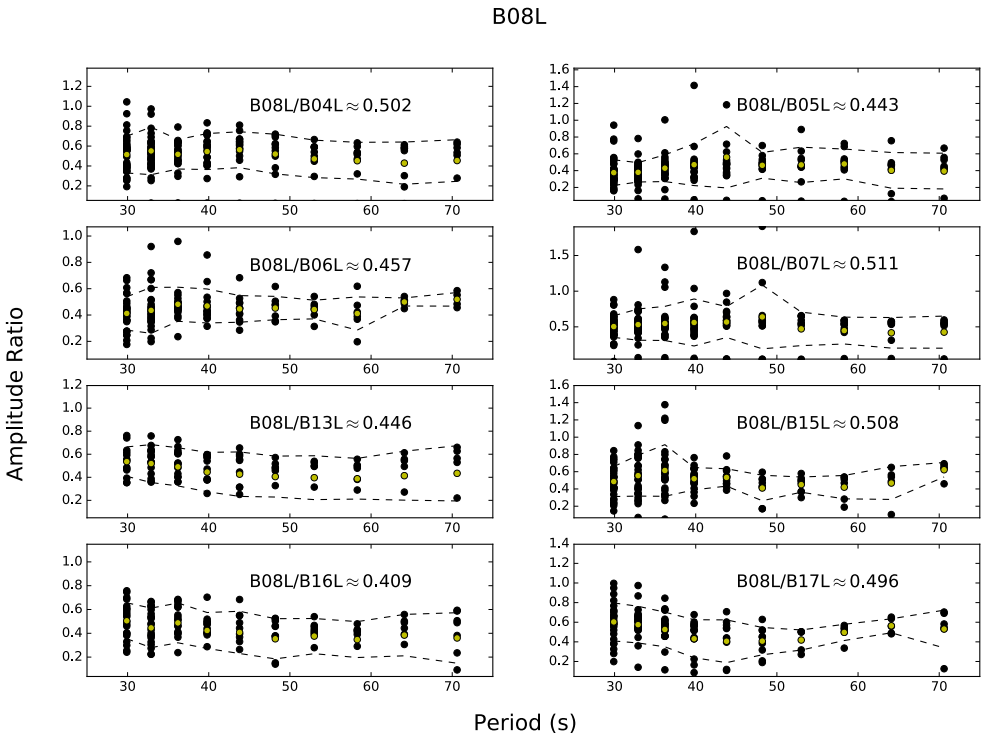


Figure 1. b) B08L and other SIO OBS stations:

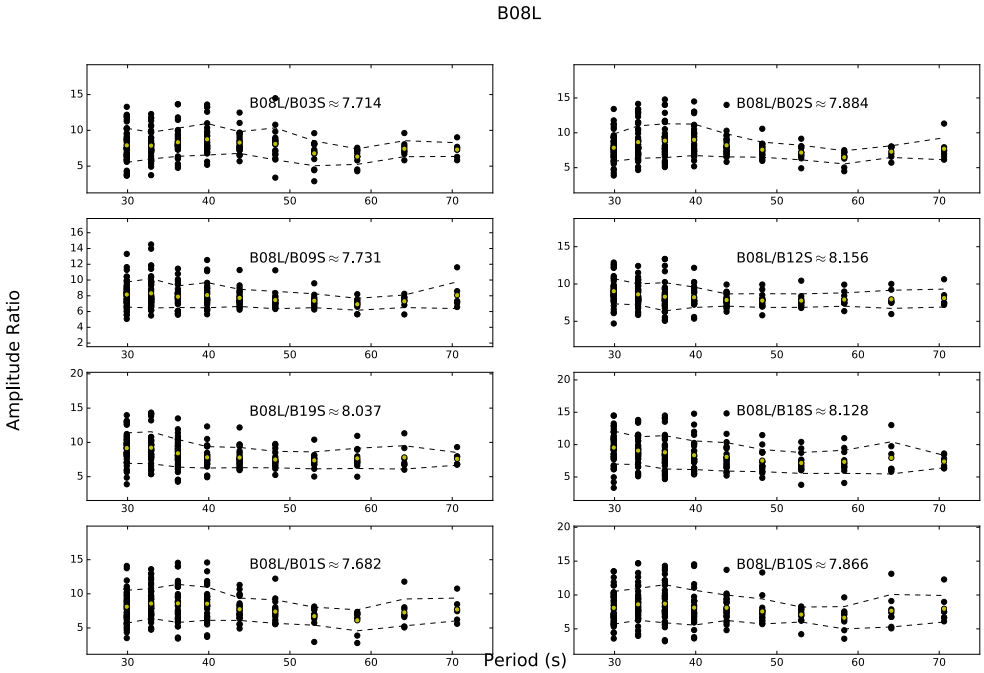
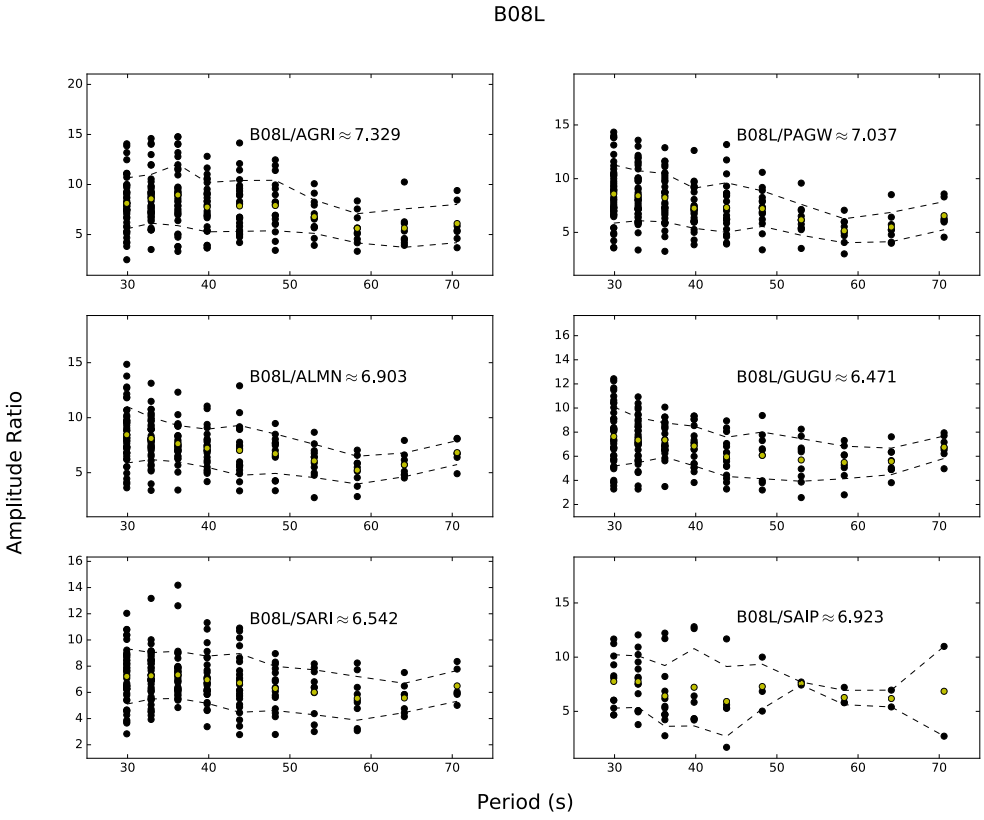


Figure 1. c) B08L and land stations:



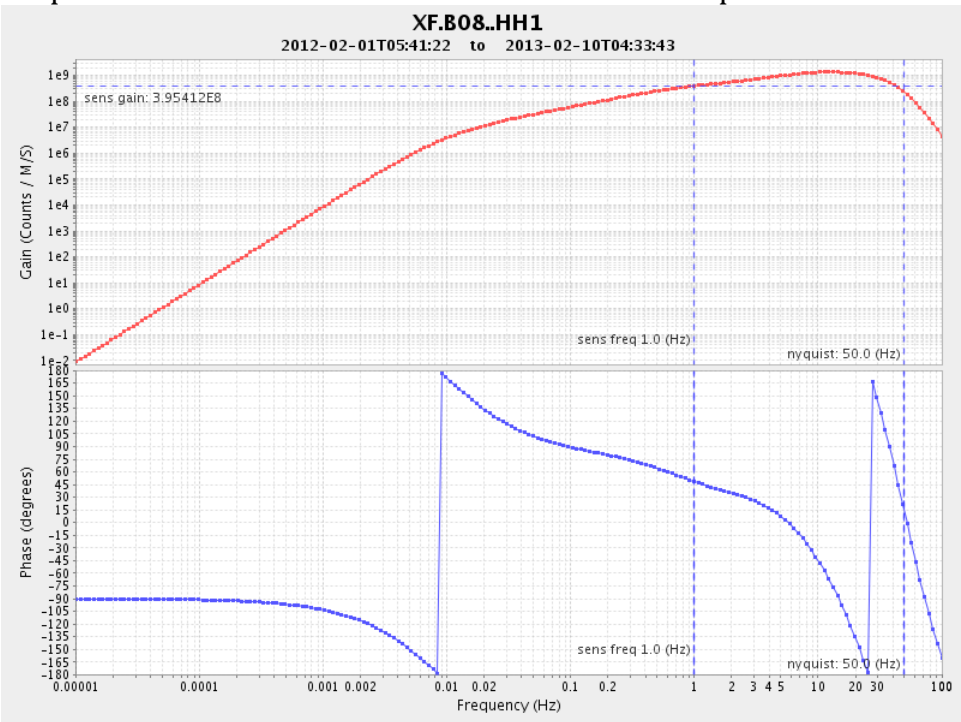
From Doug Wiens in 7/29/16 email: "*To me it looks like the average ratio of BL08 to the land stations is 6.87, and the ratio wrt to SIO OBSs is 7.90, which is quite similar and that difference can be explained by structure (Kasey - all the SIO stations are on the incoming plate, so they have a different structure on average). There is some sensitivity to structure immediately beneath the station. (just for example, we invert H/V ratios of Rayleigh waves for the structure immediately beneath the station so there is some dependence of amplitude on structure).*

The ratios of BL08 to all the LDEO OBS stations are relatively similar and average 0.47. So my interpretation is that the gains of the LDEO stations are the same except for BL08 which is about one half of the others. The differences between the other LDEO stations are small enough that they may be due to local structure beneath the station.

So it seems like the gain in the instrument response of most LDEO stations are too small by a factor of about 14 (producing amplitudes that are too large when instrument is deconvolved), and for BL08 its a factor of 7. Does that seem reasonable?"

From Doug Wiens in person on 8/26/16: B08L is on a seamount, site effects are possible.

Figure 2.
Response file for XF.B08.HH1 Mariana 2012-2013 experiment



Response file for YL.A03.BH1 Lau Basin 2009-2010 experiment