

Oceania Region Buoy Report

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2017/11/5

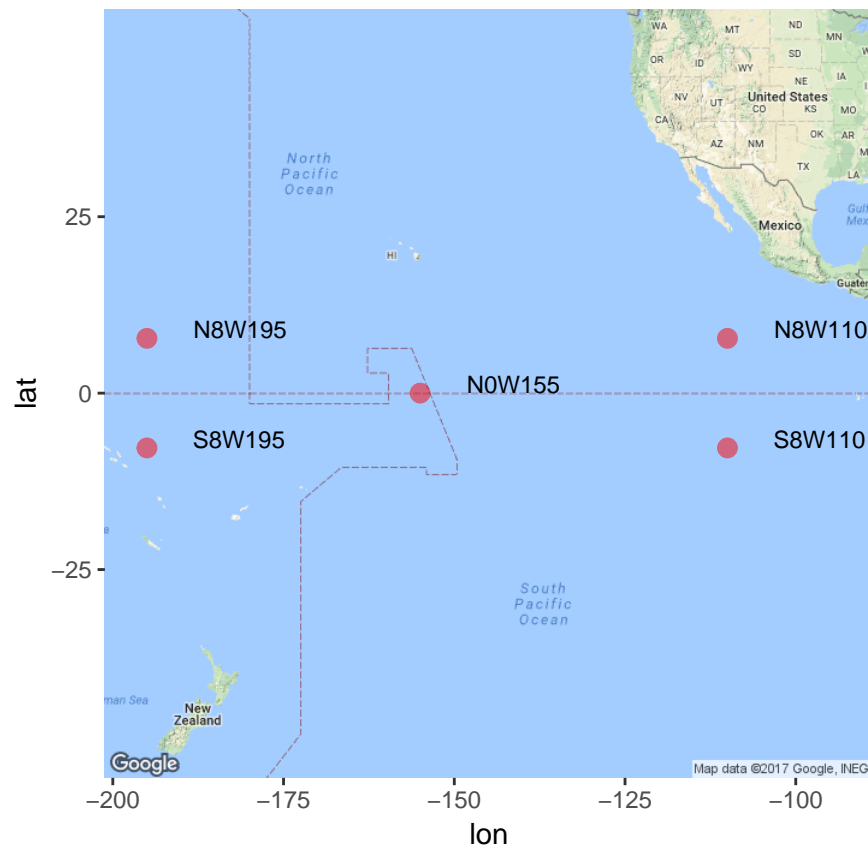
We select 5 buoys respectively at the north, south, east, west and middle points from the Oceania region, as labeled on the map. Therefore, we can have an approximate estimation of the vast region. The data are collected approximately through a 20-year period from 1980 to 2017.

```
## Warning: bounding box given to google - spatial extent only approximate.
```

```
## converting bounding box to center/zoom specification. (experimental)
```

```
## Map from URL : http://maps.googleapis.com/maps/api/staticmap?center=0,-145&zoom=3&size=640x640&scale=1
```

```
## Warning: Ignoring unknown aesthetics: label
```



For each buoy, we collect two kinds of data, one is air temperature and the other is sea surface temperature. All of the temperatures are measured at 12:00pm in local time. The original datasets are stored separately as air temperature and sea surface temperature for each buoy in text format. We import all of the ten datasets into R. As they show in the text file, we treat -9.999 and -9.99 as NAs and remove them and unrelated information, then merge the datasets and reorder the columns. The final data is exported as a csv file with 5 separate tab for each buoy's data.

```
## Warning: 4 failed to parse.
```

```
## Warning: NAs introduced by coercion
```

Table Analysis

For each buoy, we calculate the mean, median and find the maximum and minimum of the temperature in 20 years. Table 1 for sea surface temperature and table 2 for air temperature. We notice the measurement of air temperature at (N8,W110) is extremely low comparing with the others.

Table 1: Sea Surface Temperature

Buoy	Minimum	Median	Average	Maximum
N0W155	22.82	27.07	27.05032	30.666
S8E165	27.40	29.55	29.51785	31.234
N8E165	26.61	28.88	28.91582	30.880
N8W110	25.47	27.84	27.91545	30.294
S8W110	22.44	25.66	25.69386	29.220

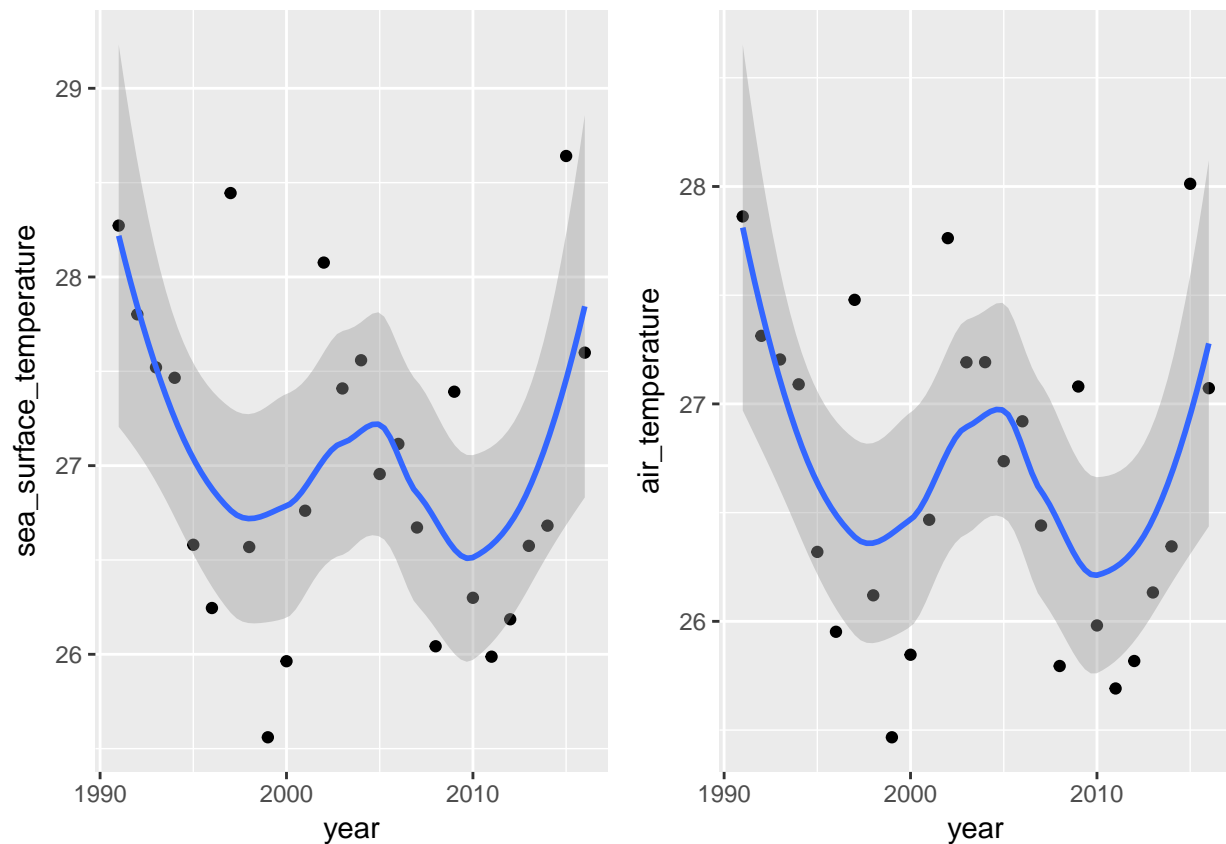
Table 2: Air Temperature

Buoy	Minimum	Median	Average	Maximum
N0W155	22.86	26.79	26.70227	29.97
S8E165	25.24	28.45	28.40675	31.21
N8E165	0.08	28.08	28.03658	29.66
N8W110	22.98	26.79	26.80862	30.07
S8W110	22.37	25.20	25.25584	28.67

Exploratory Data Analysis

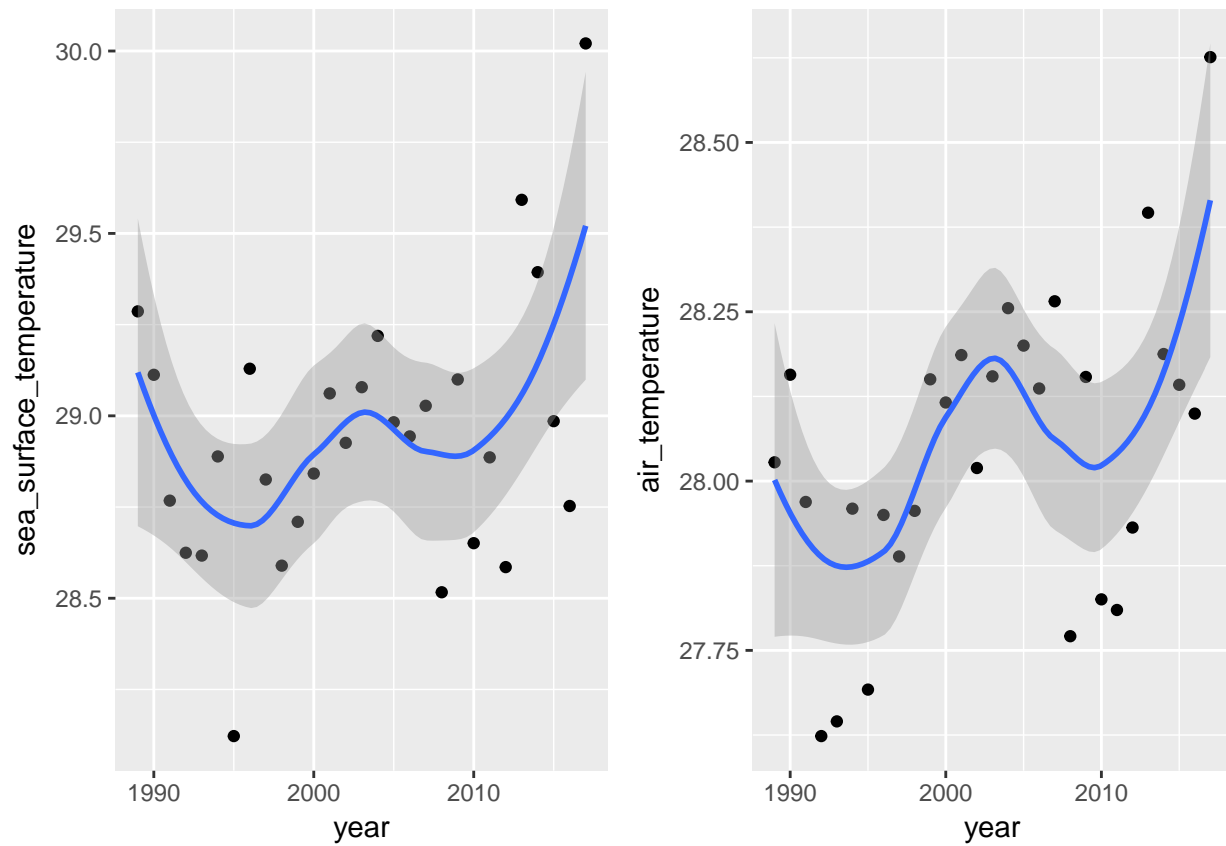
For each buoy, we calculated the mean of air temperature and sea surface temperature in each year and made a scatter plot to show the trend of temperature change in different years and also the relation between air temperature and sea surface temperature.

Buoy1: 0N155W



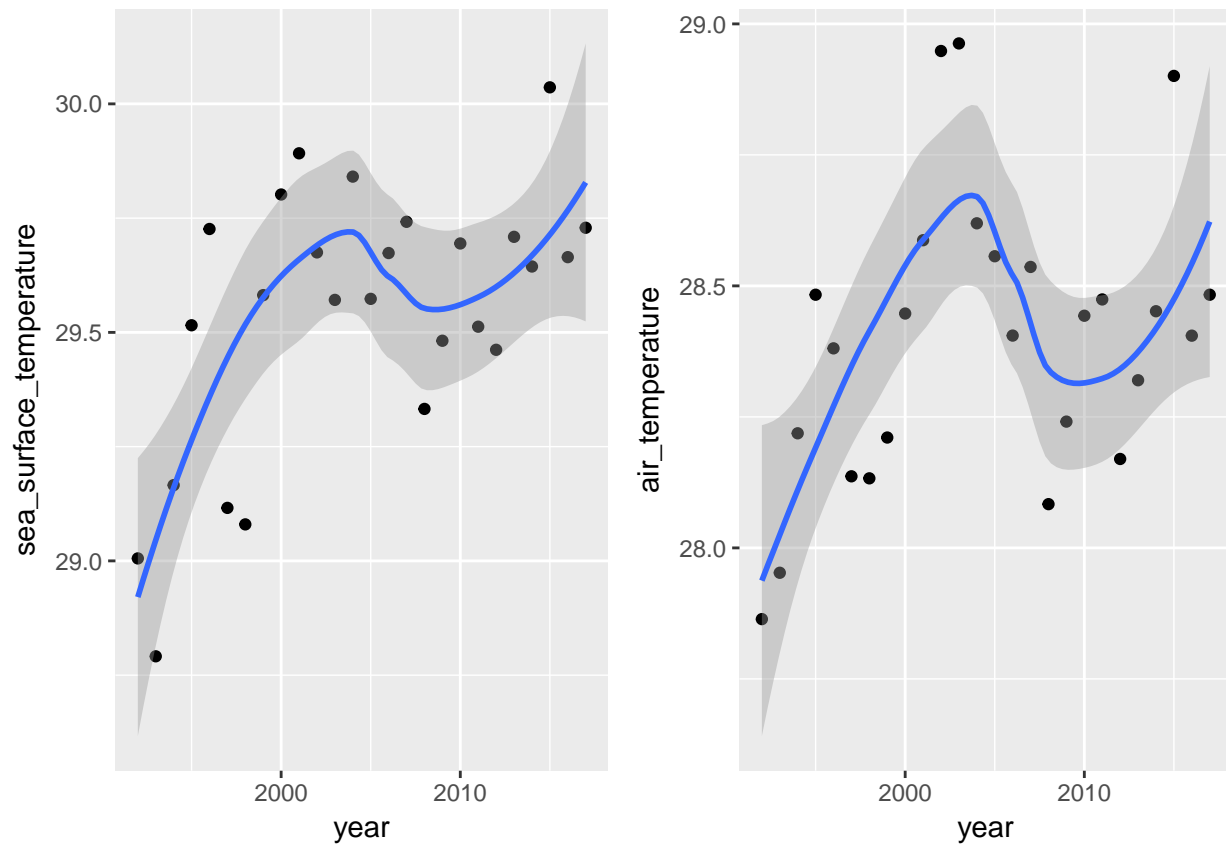
The sea surface temperature and air temperature have similar trend from 1991 to 2017, while the sea surface temperature is overall 0.5 degree higher than the air temperature. The highest temperature for both reach highest in 1990 and continuously go down until around 1997. The temperature go up 0.5 degree in 2005 and drop back in 2010. From 2010 to now, the temperature keeps rising.

Buoy2: 8N165E



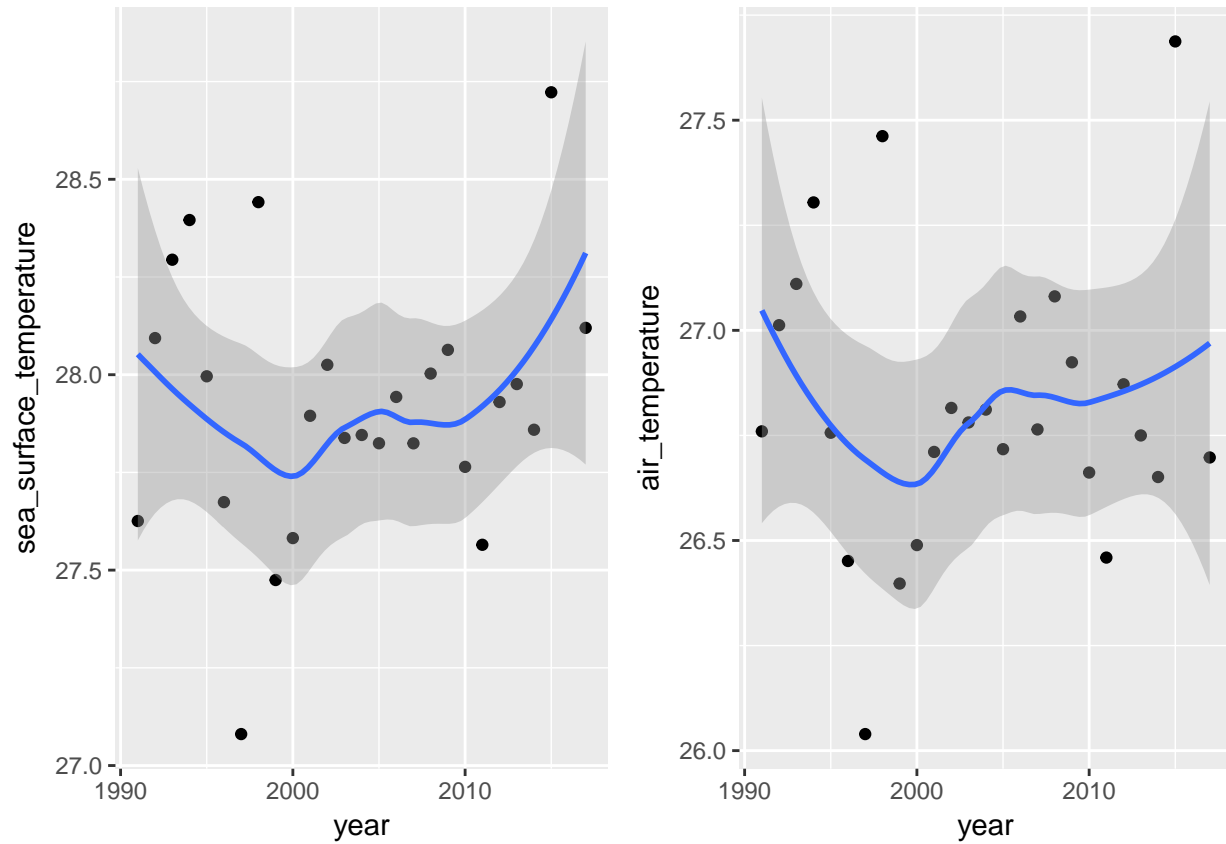
Compared to the average surface temperature and air temperature of the 8S165E point, those data of point 8N165E have a more clear trend to increase in general. And they have the same trend to decrease from 2005 to 2010.

Buoy3: 8S165E



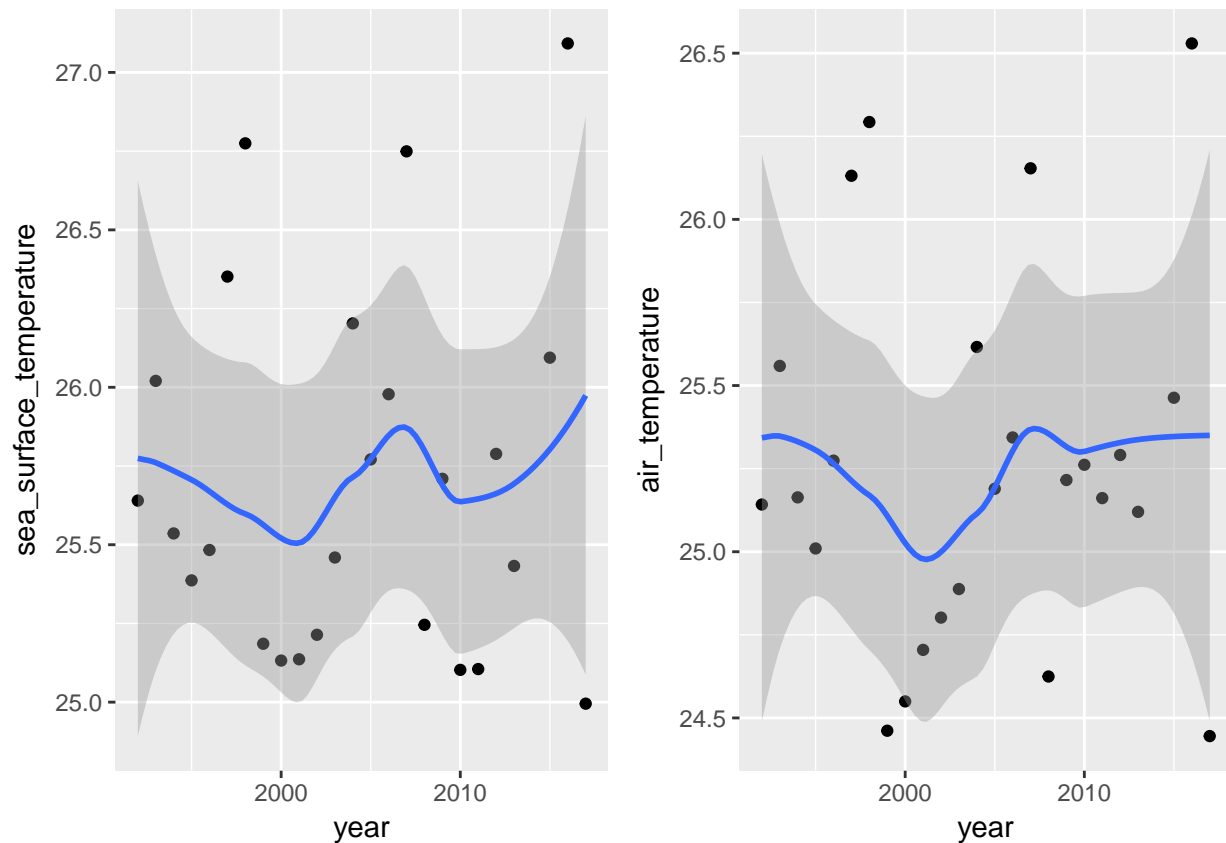
Those two graphs show how the average surface temperature and air temperature of the 8S165E point has changed since 1988. The sea surface temperature and air temperature have a trend to fluctuate during the past 20 years. The shaded band shows the range of uncertainty in the data, based on the number of measurements collected and the precision of the methods used.

Buoy4: 8N110W



Comparing the other buoys we collect, the one located at (8N, 110W) does not have much variation. The air temperature in overall is 1 degree lower than the sea surface temperature but they variate in the same direction. Both temperature decrease since 1991 and go up after 2000. Although they decrease slightly from 2005 to 2010, the temperature keep increasing greatly after 2010.

Buoy5: 8S110W



With similar trend as the N8W110 buoy, the buoy at (8S, 110W) has bigger variation. The air temperature is still slightly lower than the sea surface temperature but they still move in same direction.

Conclusion

From all of the plots, we can conclude that the air temperature is usually lower than the sea surface temperature but they move in the same direction. With different variation, all of the measured temperature decreased during 1991-1995, grew back during 1996-2000, dropped during 2001-2010 and kept fast increasing from 2011 to present.

Data Sources

1) 0N155W

Air Temperature

http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T0N155W_M_AIRT_daily.ascii

Sea Temperature

http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T0N155W_M_SST_daily.ascii

2) 8S165E

Air Temperature

[http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T8S165E_M_AIRT_daily.
ascii](http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T8S165E_M_AIRT_daily.ascii)

Sea Temperature

[http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T8S165E_M_SST_daily.
ascii](http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T8S165E_M_SST_daily.ascii)

3) 8N165E

Air Temperature

[http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T8N165E_M_AIRT_daily.
ascii](http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T8N165E_M_AIRT_daily.ascii)

Sea Temperature

[http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T8N165E_M_SST_daily.
ascii](http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T8N165E_M_SST_daily.ascii)

4) 8S110W

Air Temperature

[http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T8S110W_M_AIRT_daily.
ascii](http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T8S110W_M_AIRT_daily.ascii)

Sea Temperature

[http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T8S110W_M_SST_daily.
ascii](http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T8S110W_M_SST_daily.ascii)

5) 8N110W

Air Temperature:

[http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T8N110W_M_AIRT_daily.
ascii](http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/06-6688/TAO_T8N110W_M_AIRT_daily.ascii)

Sea Temperature:

[http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T8N110W_M_SST_daily.
ascii](http://tao.ndbc.noaa.gov/tao/data_download/cache/201711/d06-350/TAO_T8N110W_M_SST_daily.ascii)