INTERNATIONAL WCRP/IOC CONFERENCE 2017
Regional Sea Level Changes and Coastal Impacts

INHA UNIVERSITY

CODAL
COASTAL OCEAN DYNAMIC APPLICATION LAB.

A Study on the Sea Level Rise due to Density Change of Jeju Island

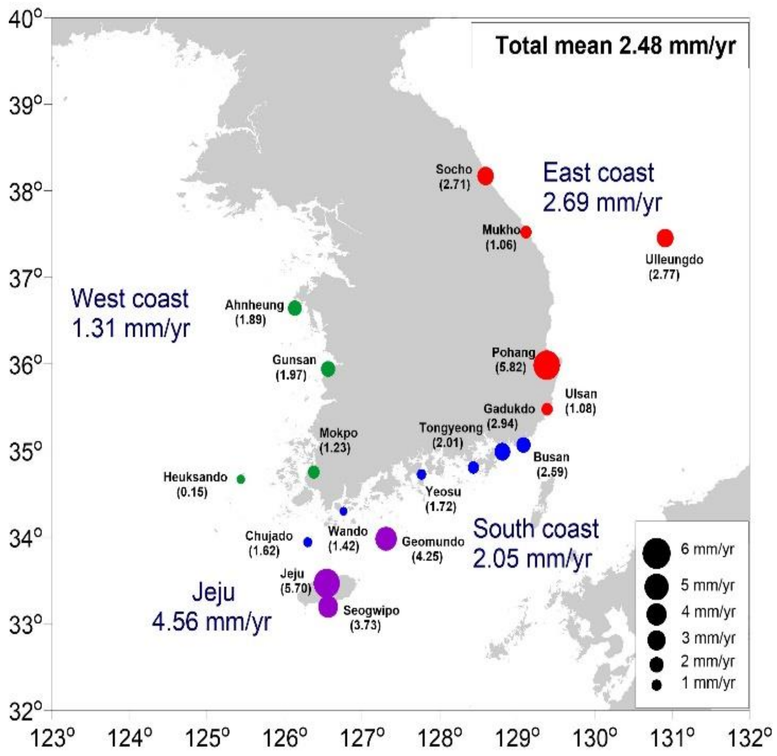
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Introduction

• According to the IPCC 5th Assessment Report (Stocker *et al*., 2014), the global mean SLR was calculated for each time period and was more than 2.0±0.3 mm/yr from 1971 to 2010

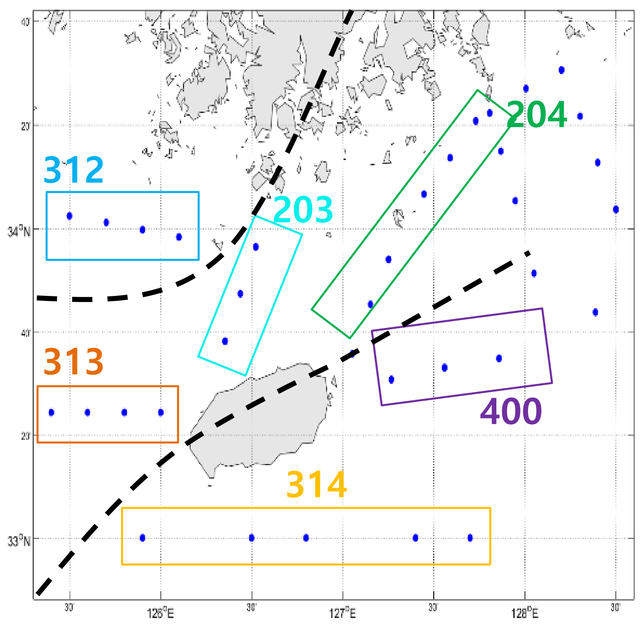
• Report published by Korea Hydrographic and Oceanography Agency (KHOA, 2015) showed that the average SLR of the entire coastal areas in Korea was 2.48 mm/yr

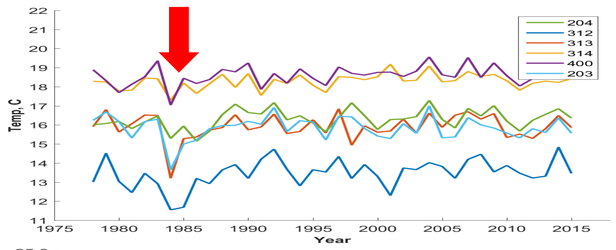
Republic of Korea coastal sea level trend

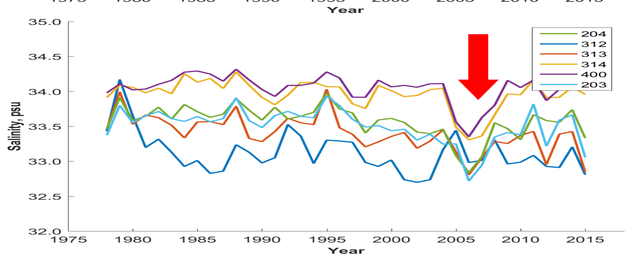


• According to the IPCC 5th Assessment Report (Stocker *et al*., 2014), the global mean sea level rise was calculated for each time period and was more than 2.0±0.3 mm/yr from 1971 to 2010
• each coastal region in Korea face a different rate of SLR, i.e., 1.31mm/yr in the west coast, 2.69mm/yr in the east coast and 2.89mm/yr in the South coast of Korea. Especially, the vicinity of Jeju Island showed one of the highest rate of sea level rise, which is 4.56mm/yr
• Due to its geographic characteristics, the island Jeju is much more vulnerable to high rate of sea level rise

Temperature and Salinity Change near Jeju Isalnd







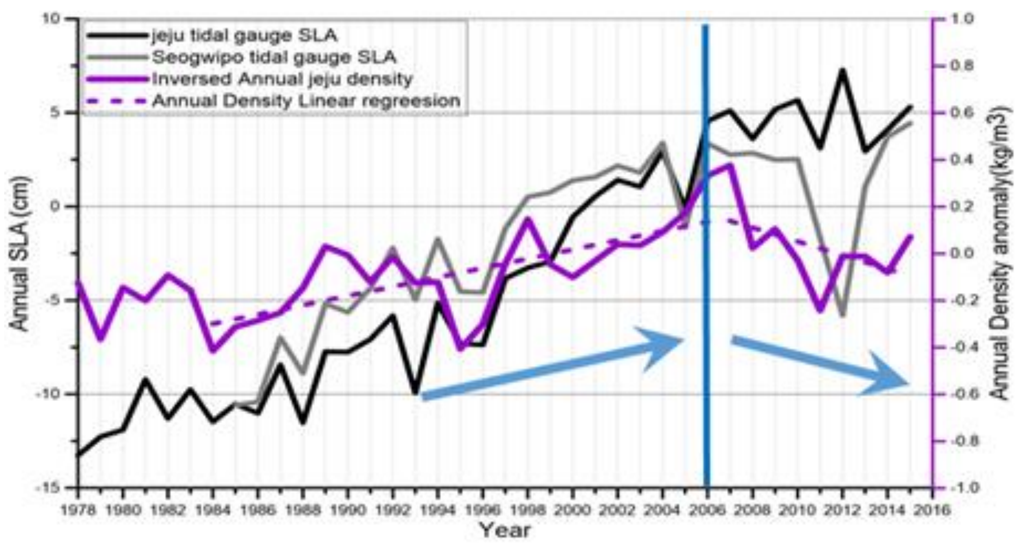
• Temperature and Salinity data of the National Fisheries Research and Development(NFRD)
• From 1978 to 2015 for 37years, 6 times a year

• The observation point was observed at least 5 times a year including summer and winter
• Vertical missing data were also excluded from the analysis to more than 5 observations per year
• The observation point is indicated by a blue dot in the figure

• Near Jeju are divided according to the everage annual characteristics
•Southwest coast(312 line) :
Low-temperature/low-salinity
•Southern of Jeju Island(314,400 line) :
High-temperature/High-salinity
•Northern of Jeju Island (203,204,313 line):
Intermediate temperature and salinity

• In 1984 and 2006, the same sudden drop in temperature and salinity reduction events occurred in all observation point

Density and Sea level Cahges Relationship



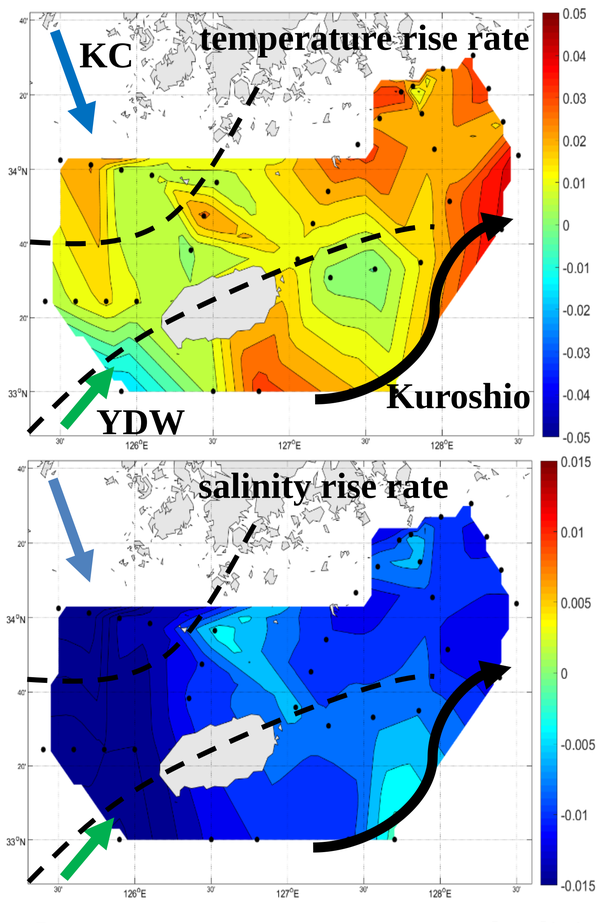
• Tidal data : KHOA provides tide level data at hourly intervals. Jeju Tidal Station (JTS) from 1978 to 2015 (38 years) Seogwipo Tidal Station (STS) from 1985 to 2015 (31 years)

• In order to investigate the effect of average density on the tidal fluctuation of the tidal stations around the Jeju Island, a time series of the annual mean sea level density inversion and annual average sea level anomaly is presented.

• The increase in seawater volume (sea level rise) due to the decrease in seawater density in 2006 and the decrease in seawater volume (sea level decrease) due to the increase in seawater density since 2006 are consistent with the annual average sea level trend in Jeju Island (Jeju and Seogwipo).

Seasonal Change Characteristics

SUMMER

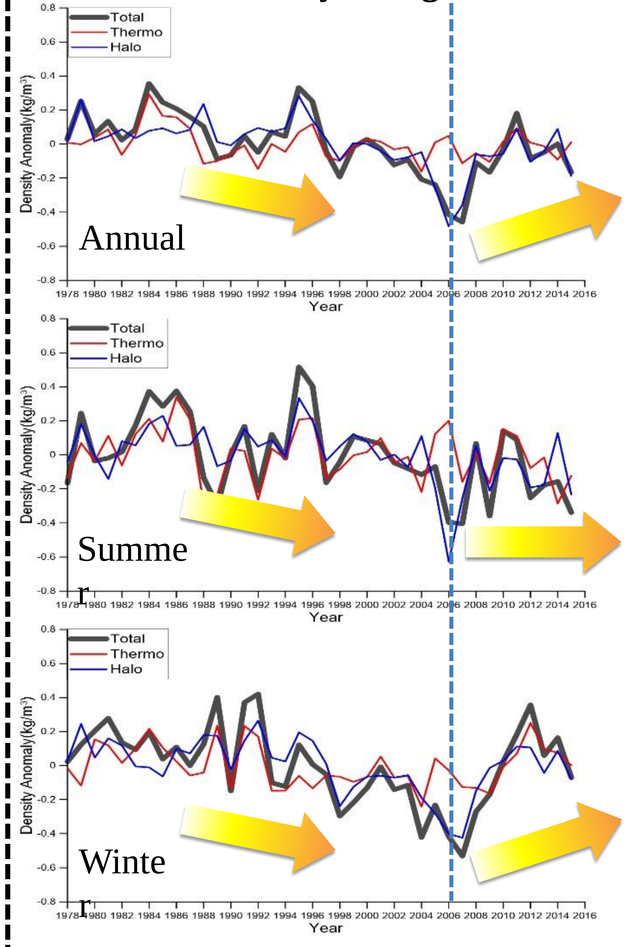


• In summer, water temperature and salinity change rate show spatial difference

• The eastern part of Jeju Island has a high rate of temperature rise
• The descent rate of salt is high in the west of Jeju Island

• The reasons for the spatial difference in summer are analyzed by the influence of the Yangtze dilution water(YDW), the Kuroshio Current and the coastal waters of the Korea Coast current(KC) in summer.

Density change



•Winter does not show clear spatial difference
• 6
• However, winter density has changed since 2006

• The annual average density change shows a sharp change from 2006 onwards, which is analyzed as winter effect.
• These changes are attributed to salinity
• Further study is needed for the exact reason

Conclusion

• The rate of sea level rise around Korea shows a distinct difference by sea area.
• The changes of water temperature and salinity in Jeju Island are different according to the sea area.
• Changes in sea level rise and density of Jeju Island will change from 2006.
• The changes in summer density occur from the Yangtze River dilution, KC and Kuroshio currents.
• Changes in density trends in 2006 are analyzed to be due to winter rather than summer, and further studies are needed.