

# TROPICAL STORM INFORMATION

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# Introduction

- Tropical cyclones have a major impact on the Madagascar population, primarily in the coast.
- Between 2000 and 2018, Madagascar was hit by 22 tropical cyclones killing approximately 970 people and displacing over 600,000.
- One of the most deadliest part of landfalling tropical cyclone are the storm surges.
- In this context, an improved information service is needed to support risk assessment and planning, to improve forecasting.

# Objectives

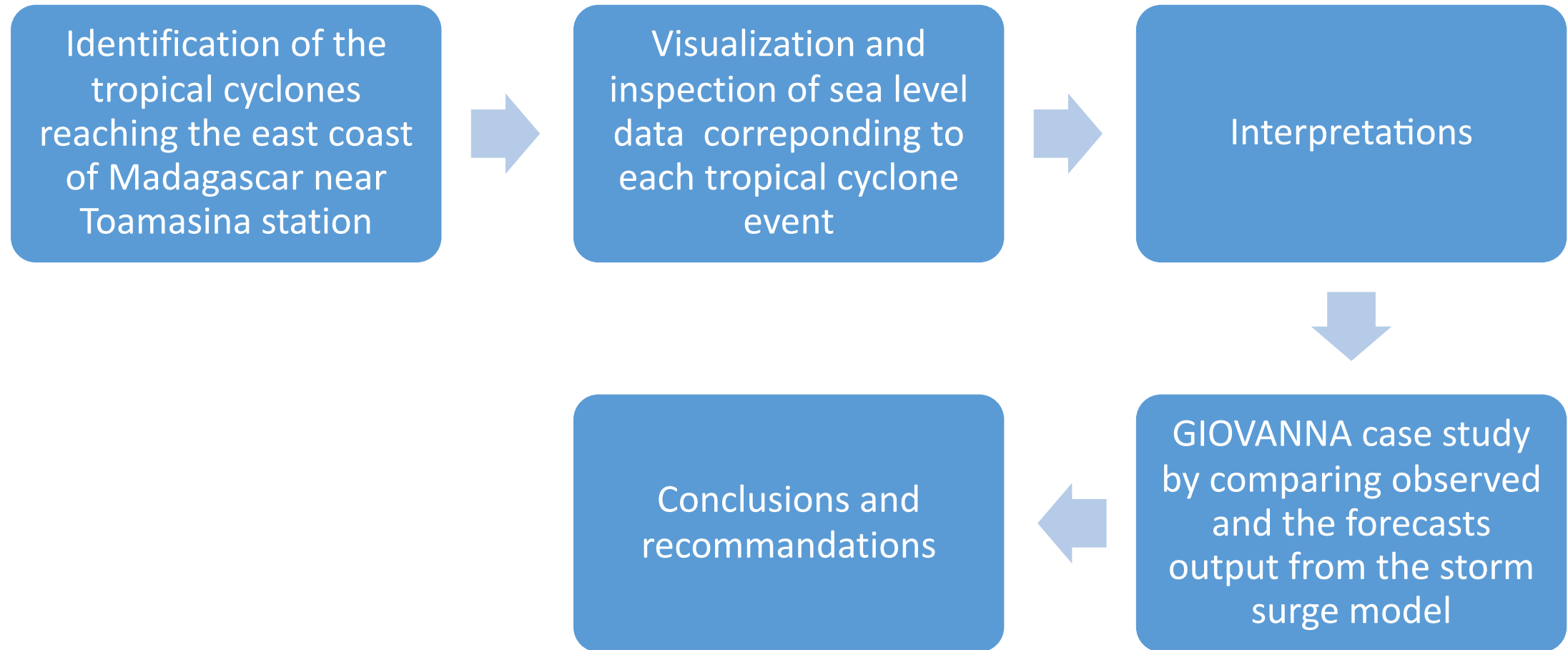
## General:

- ✓ Improve tropical cyclone information

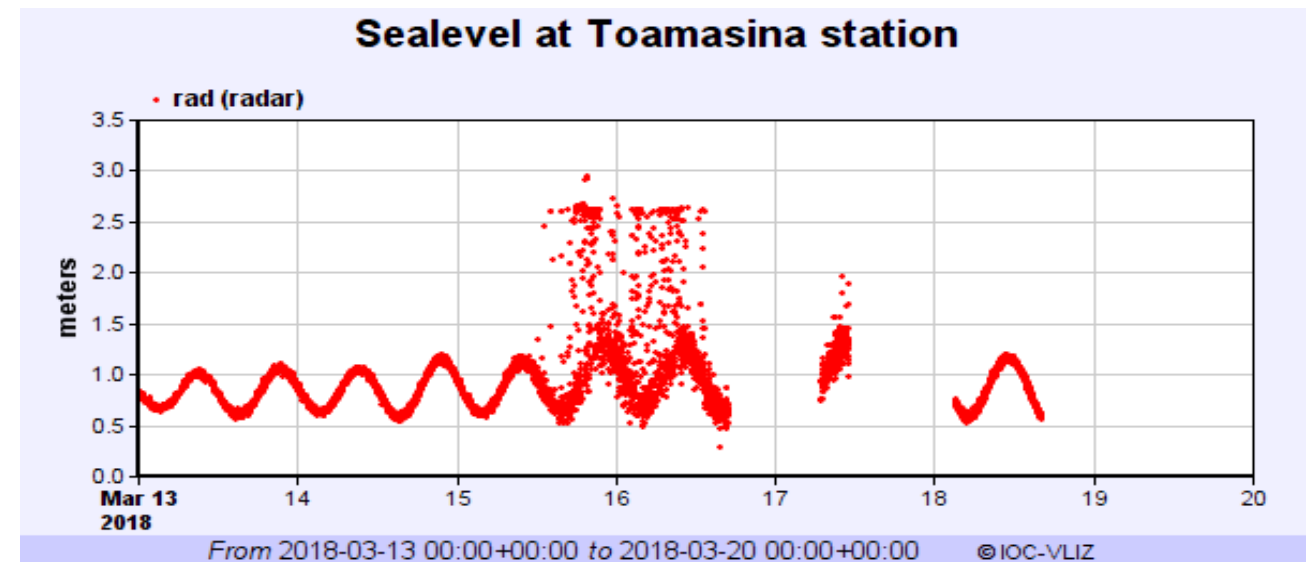
## Specific:

- ✓ Identify storm surge corresponding to different tropical cyclone tracks
- ✓ Improve storm surge forecasting model by comparing to the forecast output

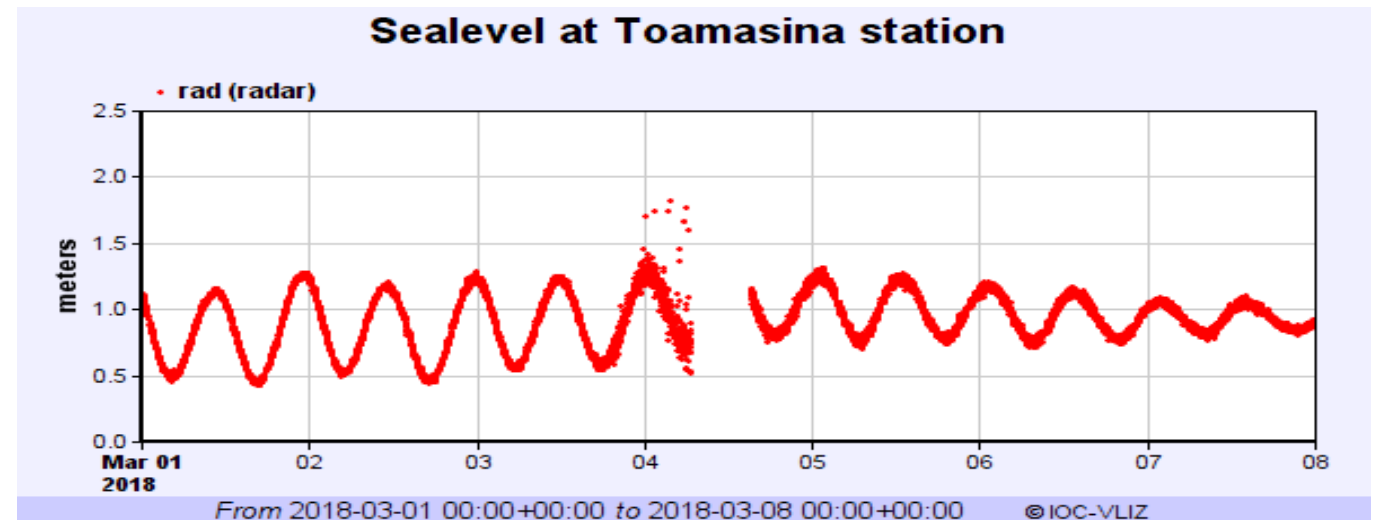
# Methodology



# Results Eliakim (16-18 March 2018)

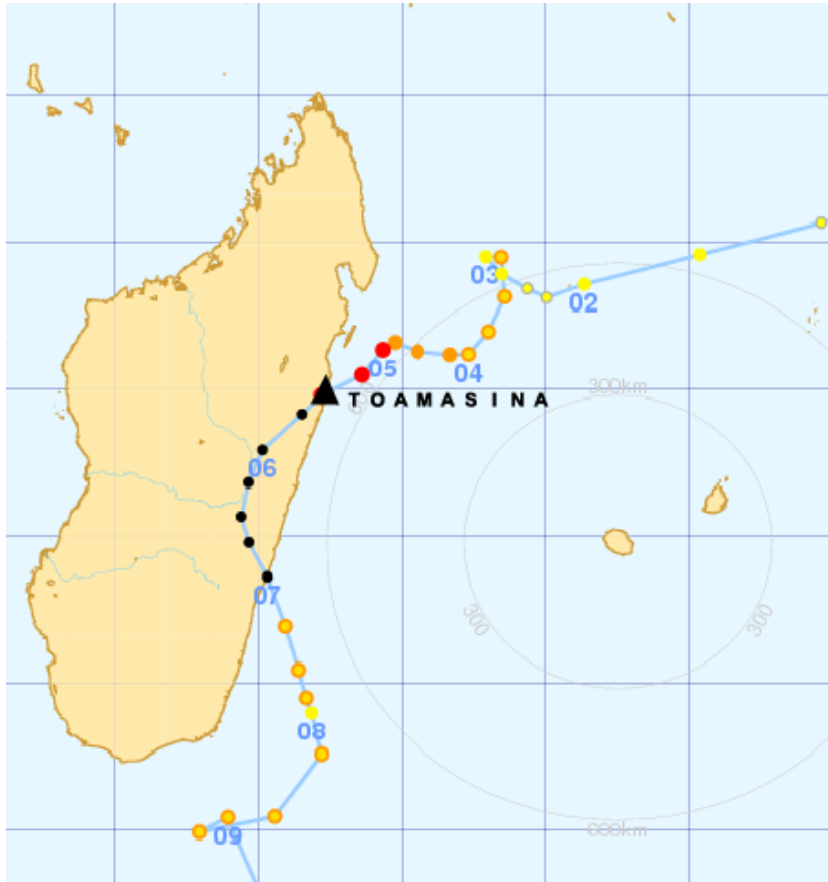


# Results Dumazile (04 March 2018)

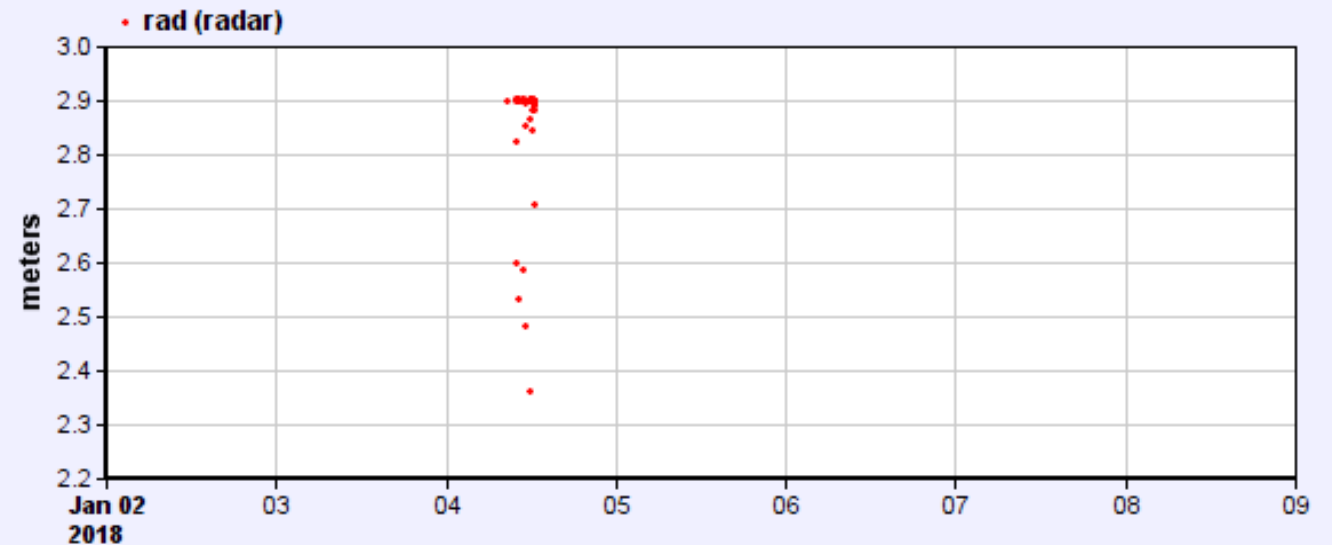




# Results Ava (05 january 2018)



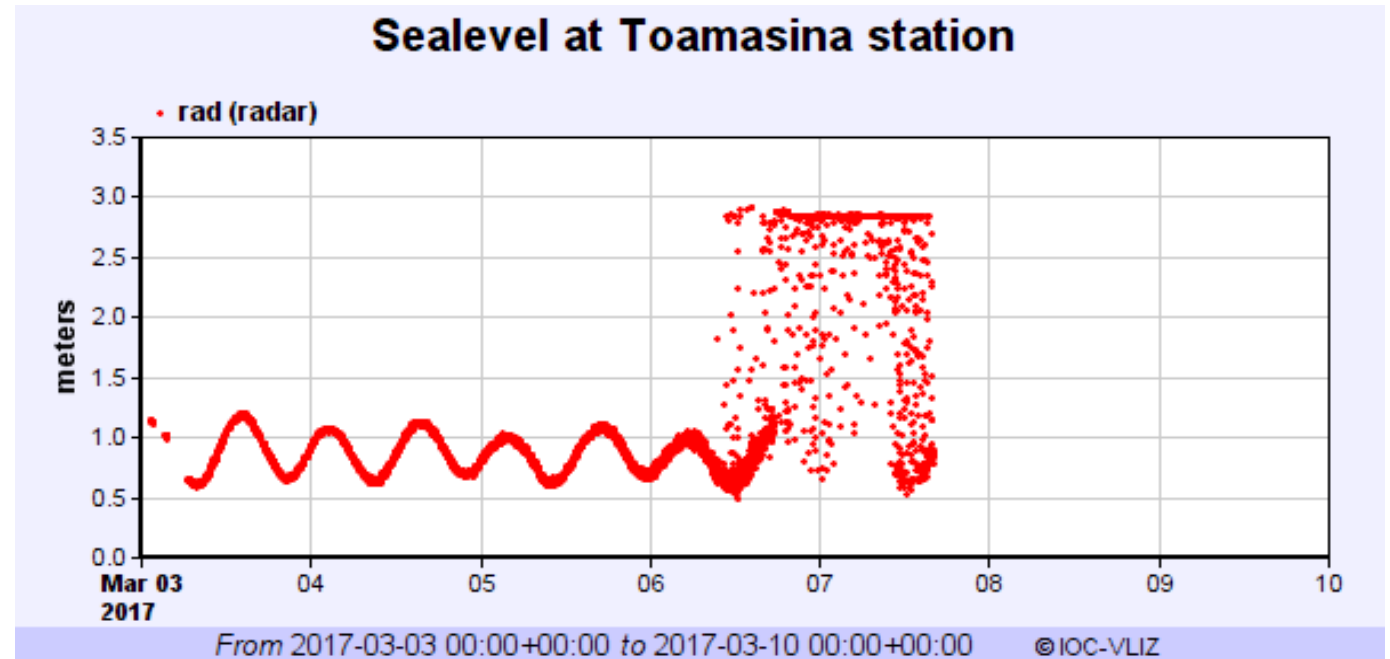
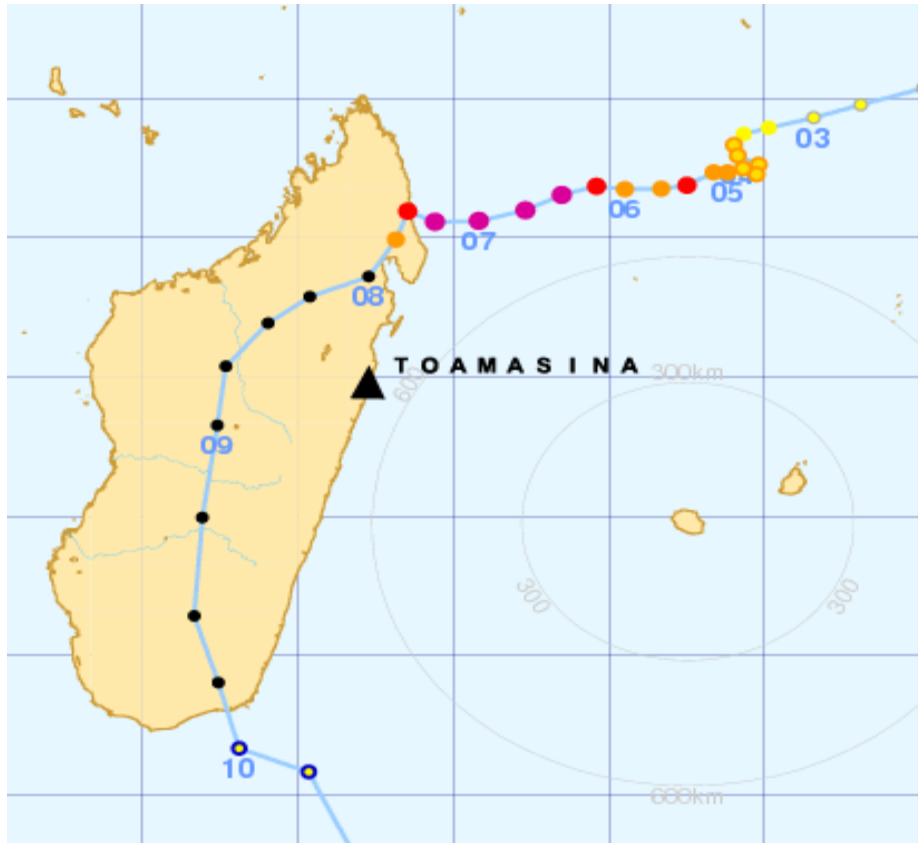
Sealevel at Toamasina station



From 2018-01-02 00:00+00:00 to 2018-01-09 00:00+00:00

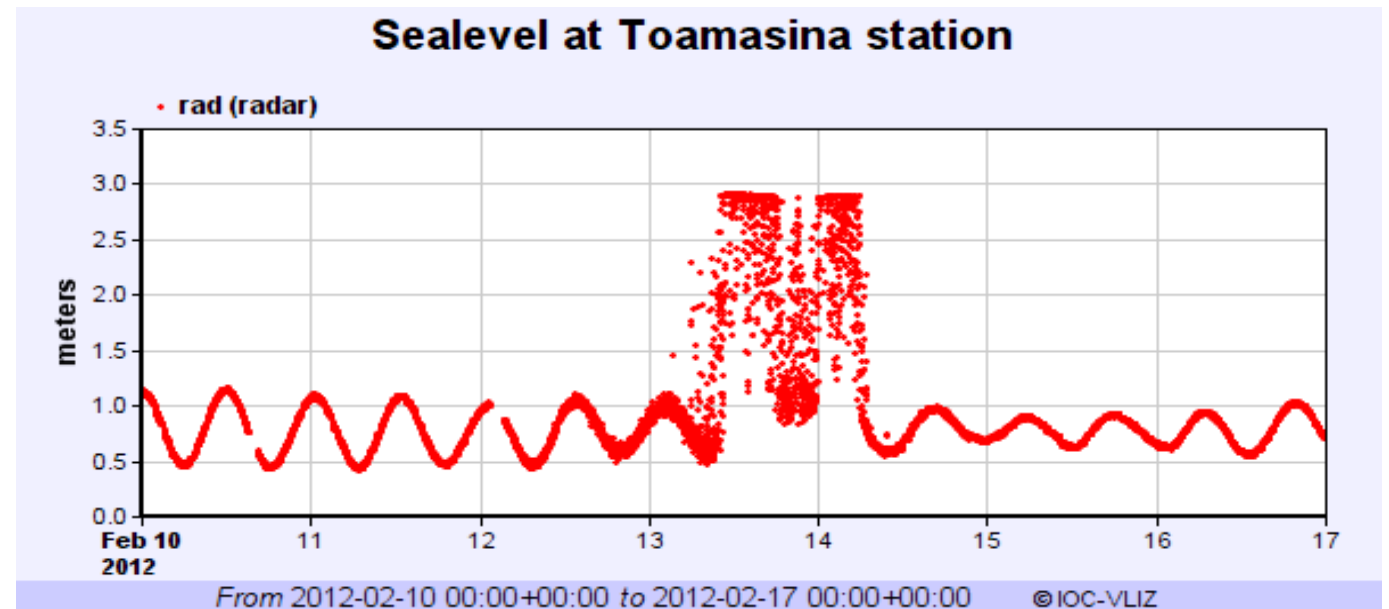
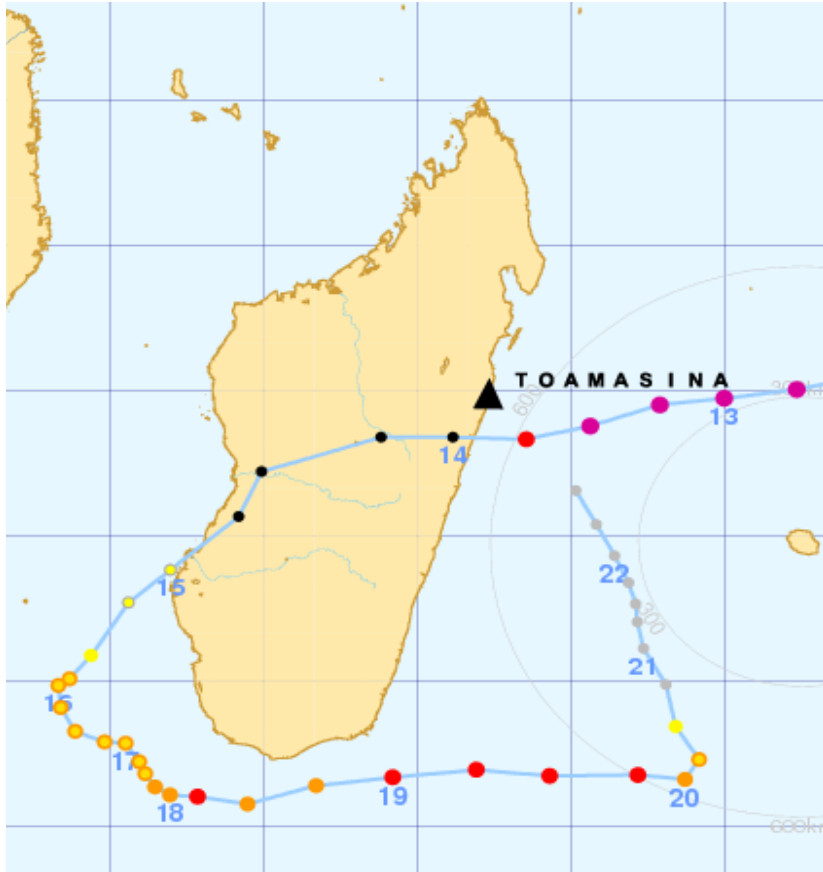
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# Results Enawo (7-10 March 2017)

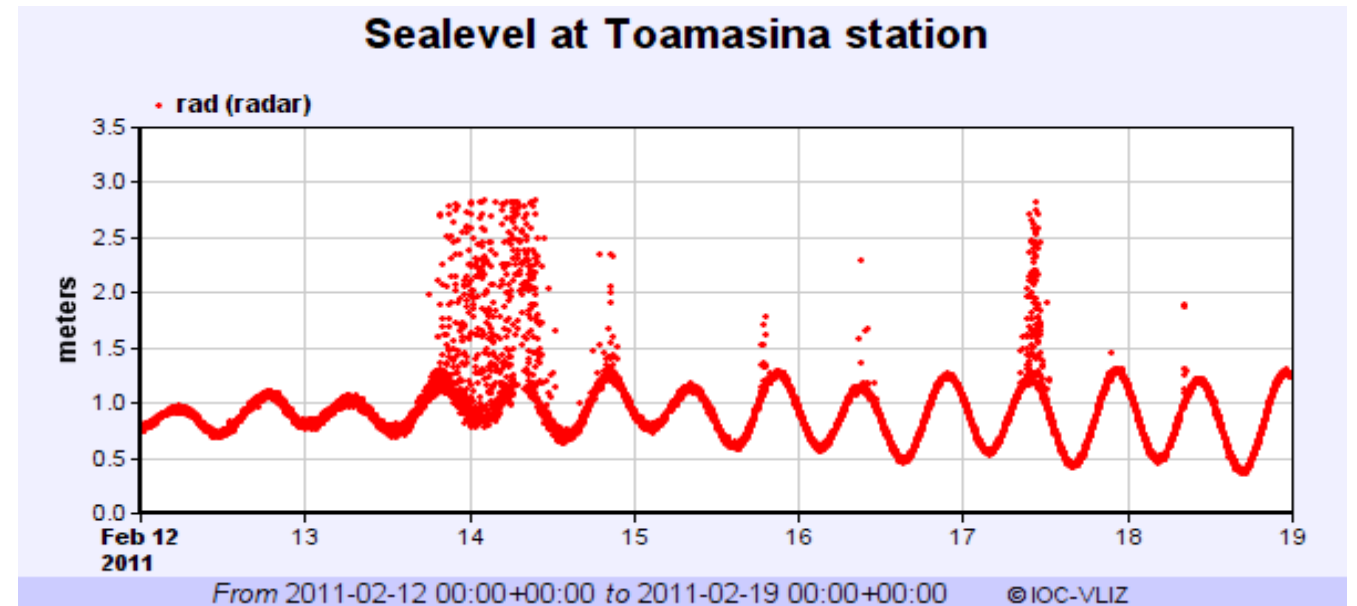
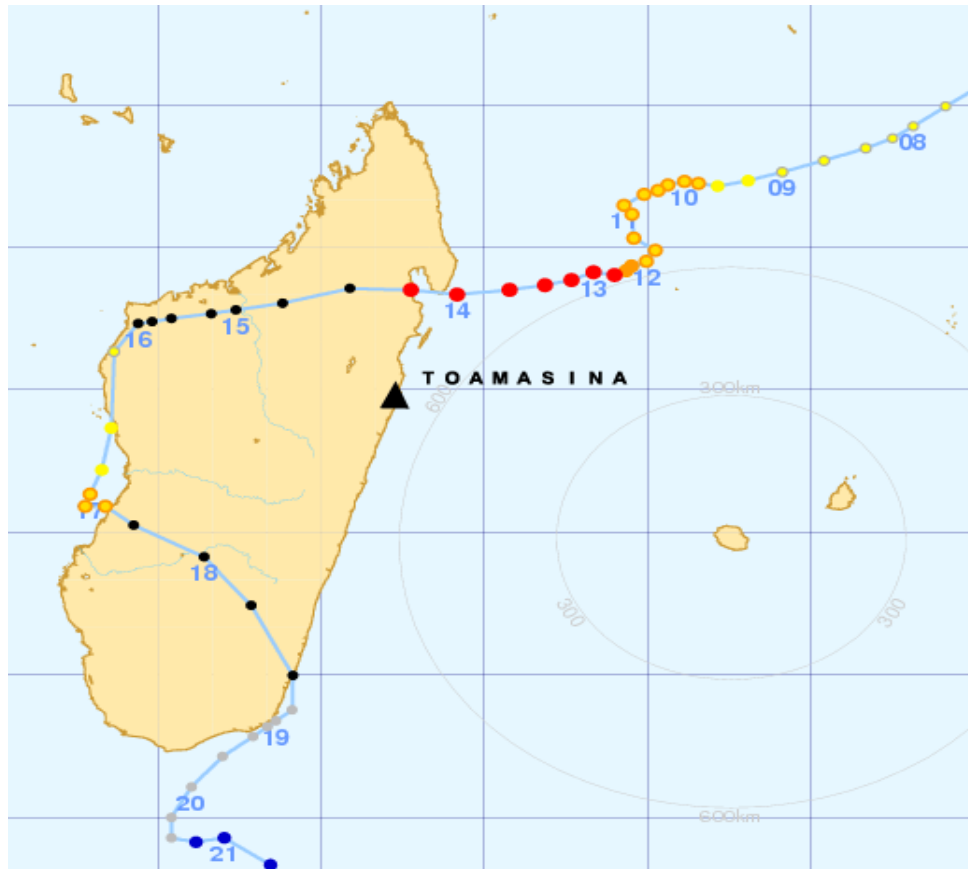




# Results Giovanna (13-14 February 2012)



# Results Bingiza (13-14 February 2011)



# Results

- For the 6 tropical cyclone cases studied, we found that the storm surge on Toamasina station depend mostly on the distance of the landfall point to Toamasina
- When the cyclone made landfall north of the station it may generate more storm surge.

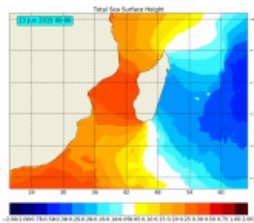
# Results Giovanna model comparison

## Bienvenue dans le modèle de démonstration des ondes de tempête à Madagascar

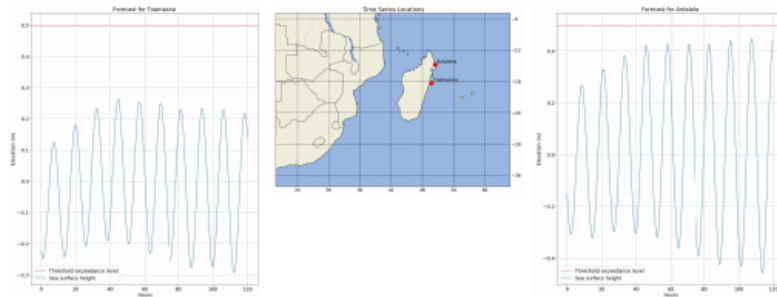
Images from the latest model run: 2019-06-13 - 2019-06-18.

### Animation

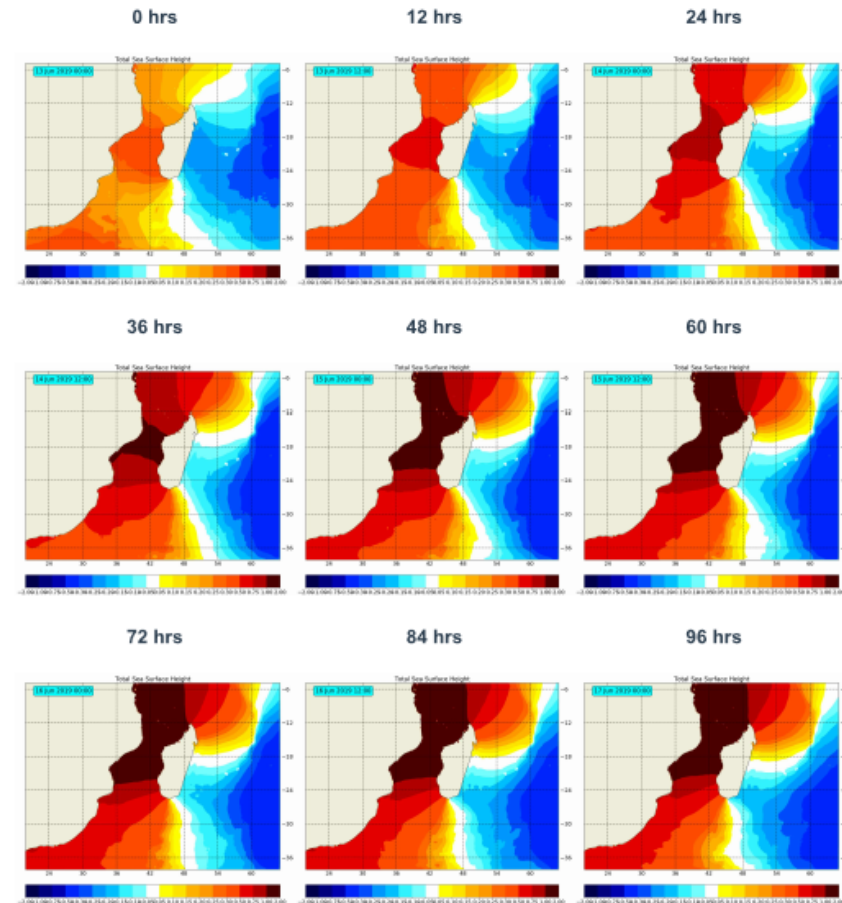
0 - 120 hrs



### Time series



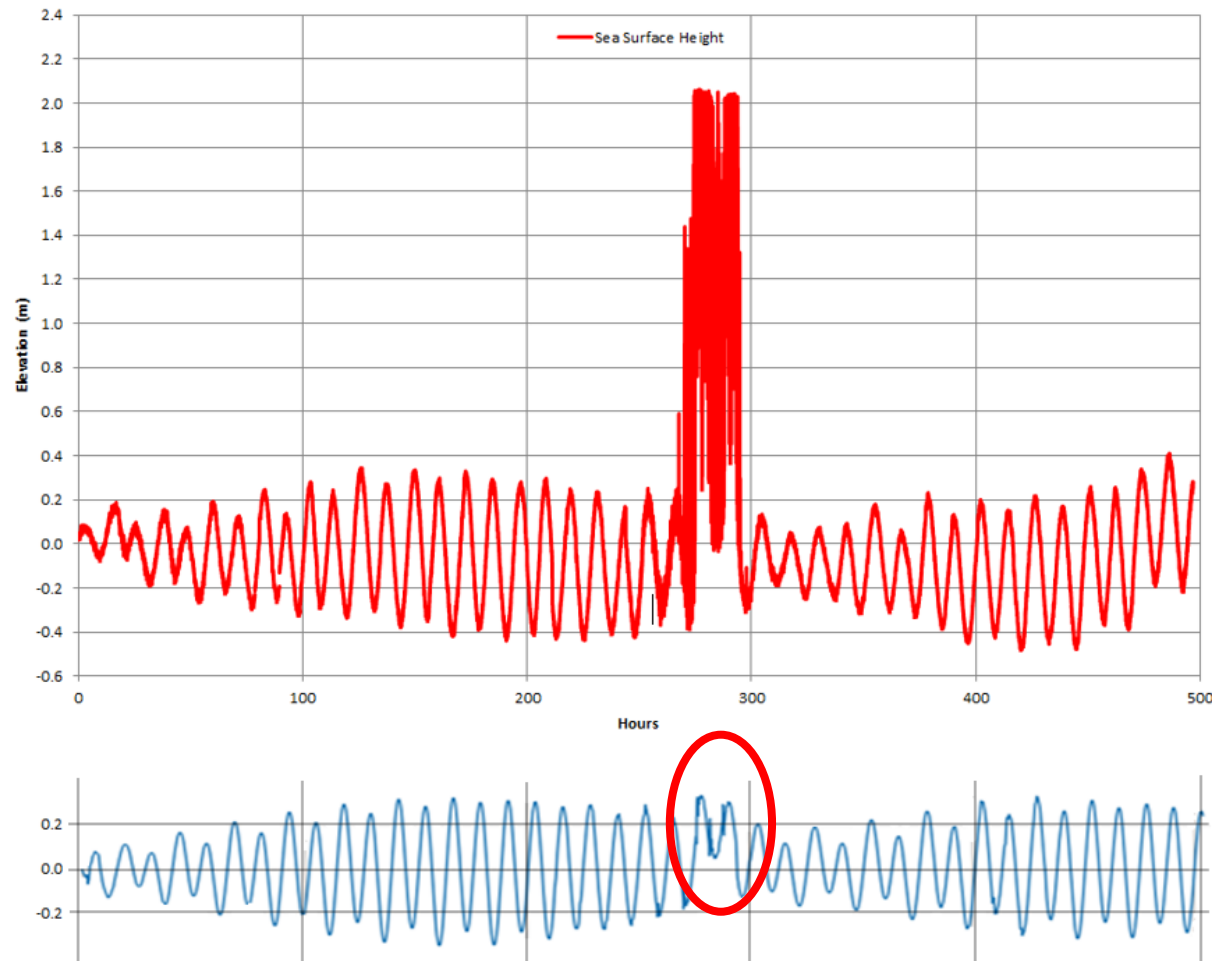
### Maps



108 hrs

120 hrs

# Results Giovanna model comparison



➤ We can see clearly that the model successfully identify the storm surge during the landfall on 13 February, although the amplitude is significantly underestimated



# Conclusion

- The distance of the landfall influence the most the storm surge generated and it is probably enhanced when the track is north to the station rather than in the south due to the clockwise rotation of winds within the tropical cyclones in southern hemisphere.
- Intensity of the tropical cyclone coupled with the lunar phase can also influence the height of the storm surge.
- On the comparison with the surge model forecast output : we found that the model is very interesting as it successfully captured the signal of the storm surge in Toamasina during the landfall. However the amplitude is significantly underestimated.

# Recommendations

- More observed sea level data is really needed. Some ways to calibrate some satellite data may be very useful
- More tropical cyclone tracks can also be considered. For example tracks from the West.
- Time was very limited to compare other cases of tropical cyclones because it takes around 4 hours to generate an historical forecast.
- Coupling the surge model with limited area model such as Weather Research Forecasting (WRF) Model may be very interesting.

# Thank you!