

International Conference on Climate Change and Coral Reef Conservation  
In Okinawa, Japan (June/29-30/2013)

Session 4

# Adaptation to the Impacts of Climate Change

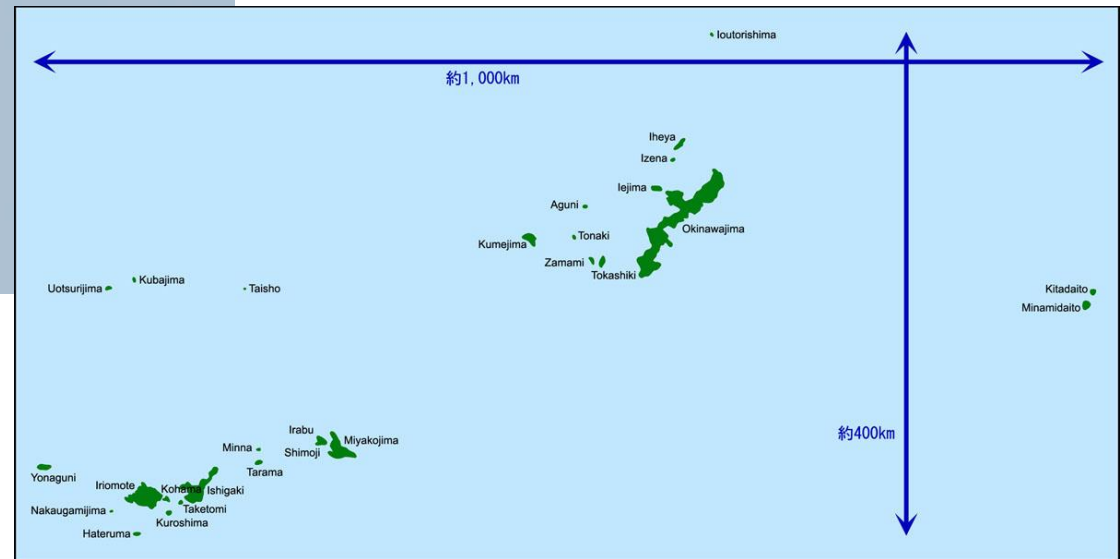
What happen by Climate Change and  
What we can do against them

Jun-ichiro Giorgos TSUTSUMI

University of the Ryukyus

[jzutsumi@tec.u-ryukyu.ac.jp](mailto:jzutsumi@tec.u-ryukyu.ac.jp)

# What is Okinawa?



- Okinawa consists of about 160 islands, 40 islands are inhabited.
- Total land area is about 2,266km<sup>2</sup>, it is 0.6% of total Japan.
- Total population is about 1.4 millions, it is 1.2% of total Japan.
- Over 50% of the total area and over 90% of the population in Okinawa island.

# Impacts of Climate Change

- **Climate Change Itself**

- Very difficult to recognize the warming (0.8deg/100yr)
- Extreme meteorological events, cold summer, warm winter, very hard rainfall and so on
- Shorter return period of extreme meteorological events

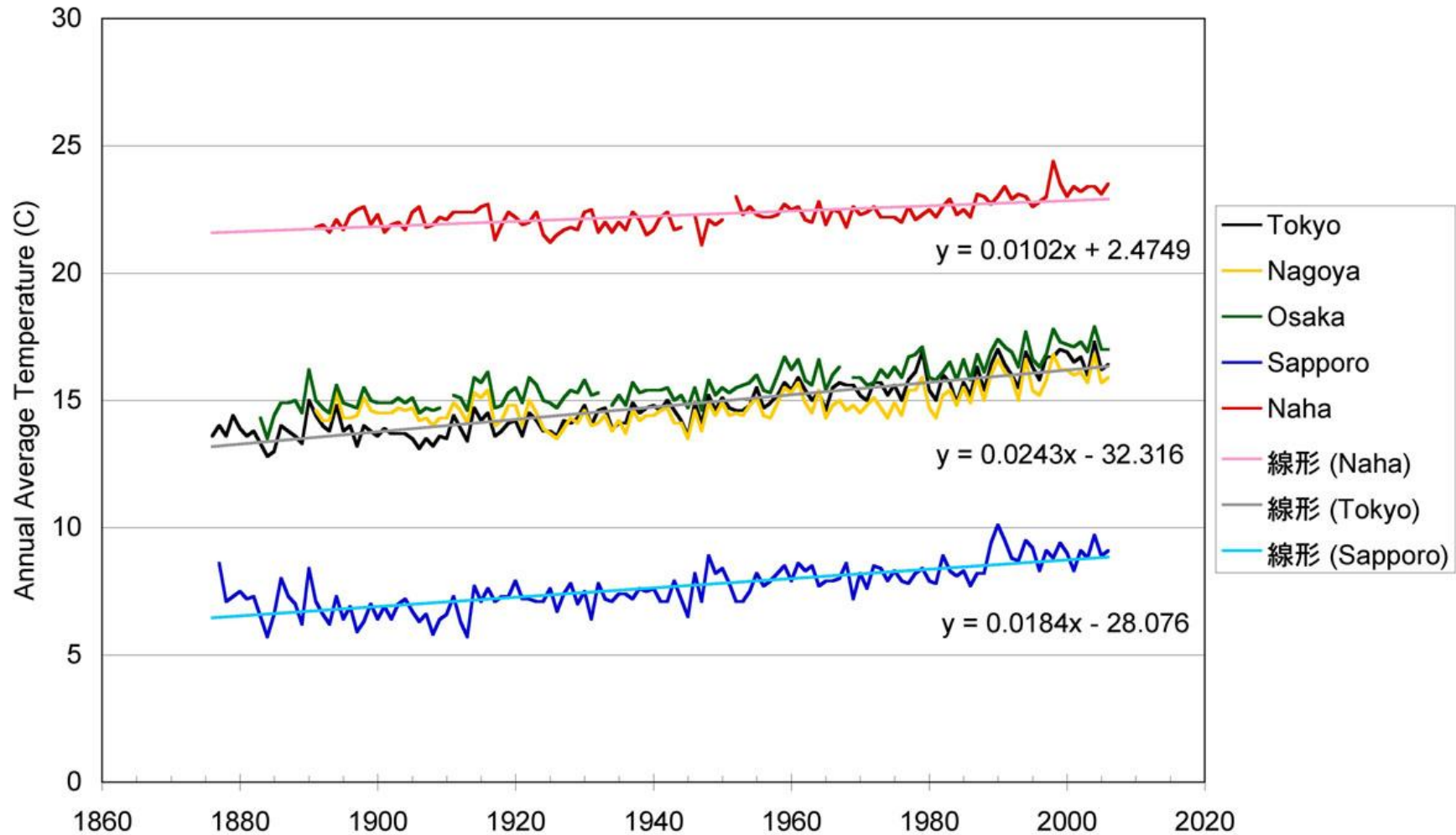
- **Biological and Ecological Impact**

- Invasion by unexpected non-vernacular species
- Infections by unexpected non-vernacular microbes
- Explosive increase and/or decrease of specific species

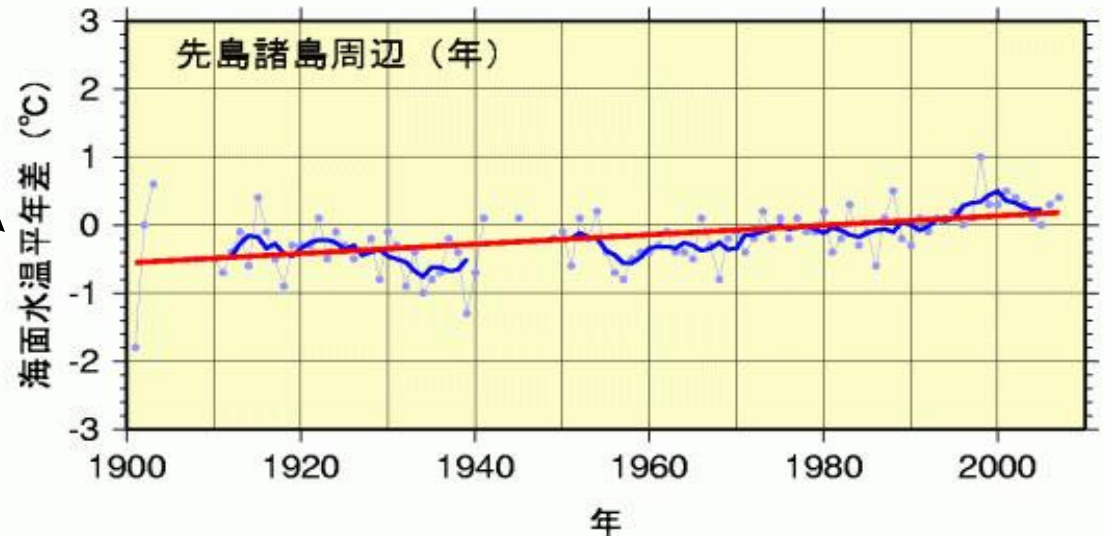
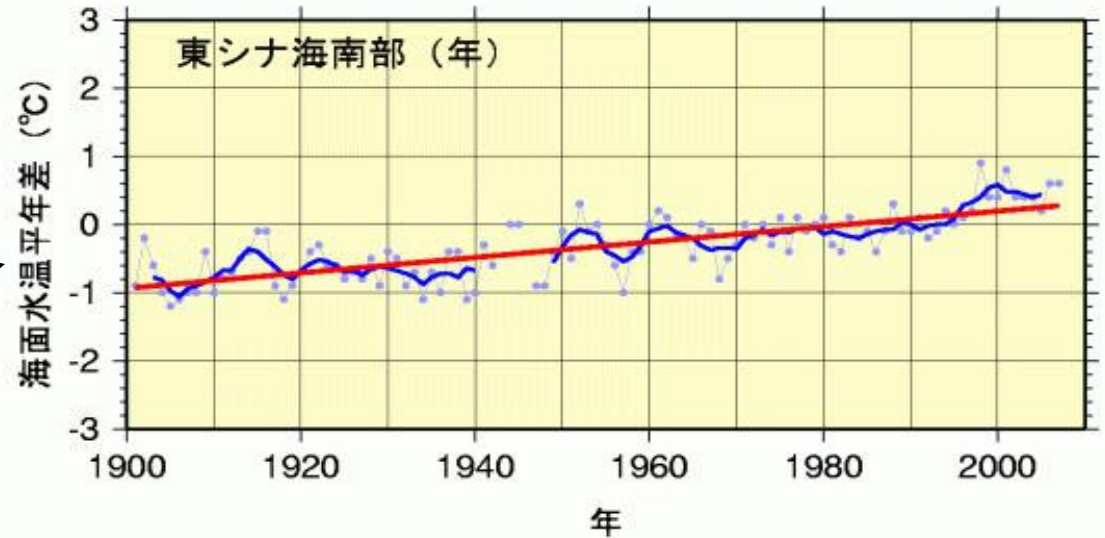
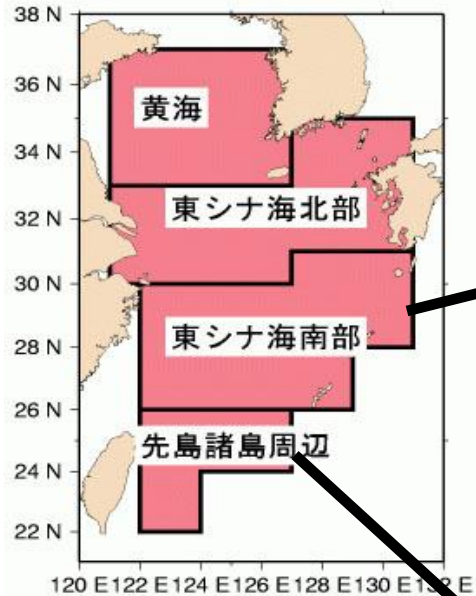
- **Sea Level Rising**

- Antarctic ice and glaciers melting
- Especially strong impacts in South Pacific Ocean

# Temperature changes at Japanese cities



# Changes of Sea Water Temperature


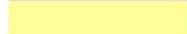


Deviations from 30-year  
average temperature,  
1961-1990

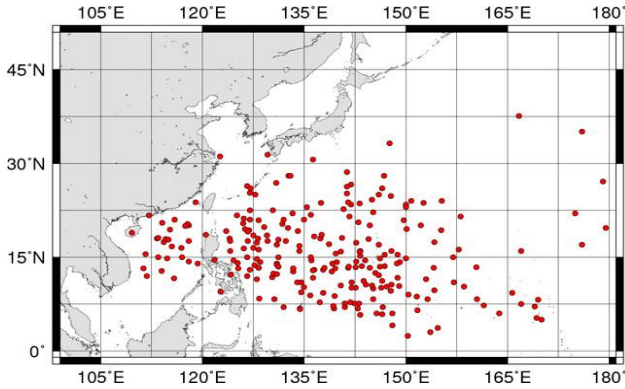
# Records of Meteorological Events at Ishigaki Met. Observatory

Ishigaki (Okinawa) (1896-2010)

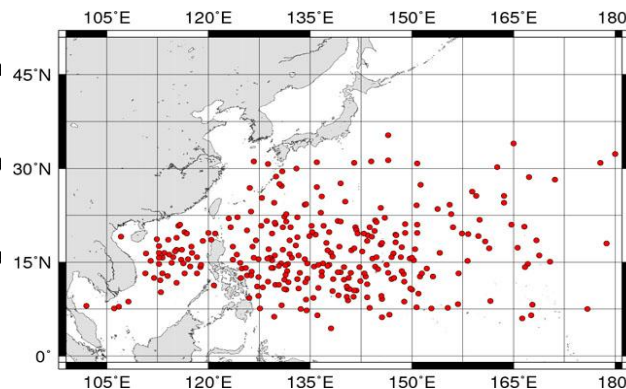
Facotr/Rank	1	2	3	4	5	6	7	8	9	10
1hour Precipitation (mm)	122 (1989/ 5/19)	111.8 (1944/11/ 1)	99 (1989/ 5/18)	98 (1970/12/12)	96.3 (1924/ 7/14)	95.4 (1957/ 5/14)	94 (2010/ 2/22)	92.5 (1898/ 8/ 6)	91.8 (1925/ 8/27)	88.7 (1937/ 3/30)
1day Precipitation (mm)	410.5 (1984/ 4/18)	374 (2010/10/22)	336.5 (2002/10/30)	304.5 (1989/ 5/18)	304 (1981/ 7/22)	302 (2008/ 9/13)	297 (1997/ 8/17)	285 (1972/ 7/23)	278 (1981/ 8/31)	275 (1998/12/20)
Monthly Precipitation (mm)	933.5 (2010/10)	826 (2001/ 9)	732.5 (1898/10)	729.1 (1931/ 8)	716 (2002/10)	707.6 (1924/ 7)	687.8 (1965/ 6)	673.3 (1935/ 7)	671.7 (1936/ 5)	667.5 (2008/ 9)
Daiurnal Min. Temp. (°C)	29.7 (2007/ 7/18)	29.6 (2007/ 7/19)	29.6 (1998/ 8/27)	29.6 (1998/ 8/17)	29.5 (2010/ 7/ 8)	29.5 (2010/ 7/ 4)	29.5 (2007/ 7/17)	29.5 (2003/ 7/23)	29.5 (1998/ 8/28)	29.5 (1998/ 8/15)
Monthly Av. Temp. (°C)	30.7 (1956/ 7)	30.5 (2007/ 7)	30.3 (2003/ 7)	30.3 (1998/ 8)	30.2 (1998/ 7)	30.2 (1988/ 7)	30.2 (1983/ 7)	30.1 (1993/ 7)	30 (2001/ 8)	30 (1991/ 7)
Annual Av. Temp. (°C)	25.4 (1998)	24.8 (2007)	24.6 (2009)	24.6 (2006)	24.5 (2008)	24.5 (2002)	24.5 (2001)	24.5 (2000)	24.5 (1999)	24.5 (1991)

 2010  
 2000-2009

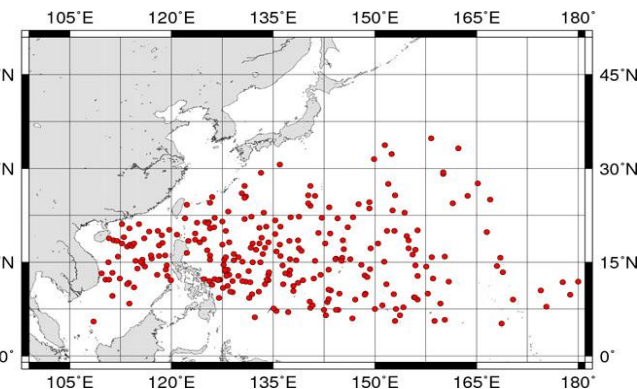
# Forming points of Typhoons



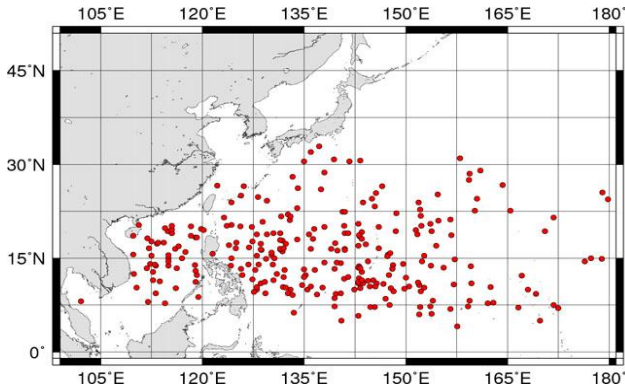
1951-1960



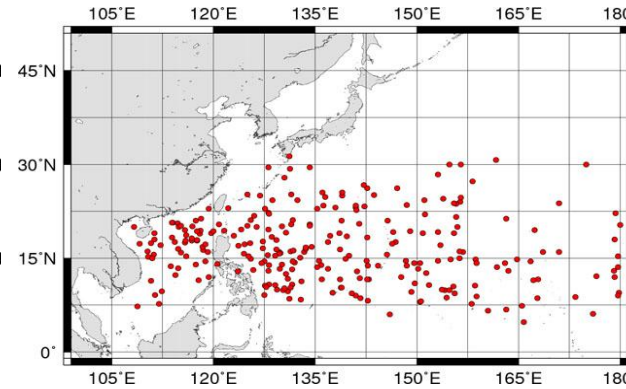
1961-1970



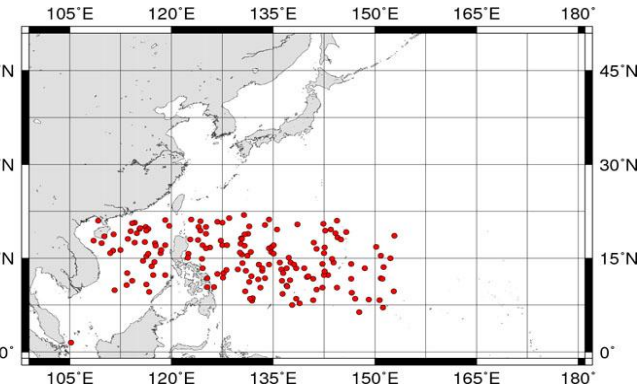
1971-1980



1980-1990



1991-2000



2000-2010

# Iguanas in Ishigaki Island



from HP of Naha Natural  
Environment Office, MOE



Reproduction in Ishigaki Is.



# Explosive Reproduction of Invading Plant (*Leucaena leucocephala*)



Cut down and dumped  
near Gushikawa Castle  
Ruin, Itoman

Shiokawa, Motobu

