Lost in Translation
How can science better inform the public about natural hazards

迷失在翻译
如何更好地用科学为公众翻译自然灾害

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Integrated system of observing sensors and forecast models

TO OBSERVE
TO PREDICT
TO COMMUNICATE

Weather, Currents, Water Level, Salinity, Temperature, Waves
NYHOPS OMDR:
Real-Time Data
Forecasts out to 48 hours

http://www.stevens.edu/maritimeforecast
• Color Coded Flood Levels
• Vertical datum selection
• Units selection
• Download data option
Hurricane Sandy
2 PM EDT Mon Oct 29 2012
Position 38.3 N 73.1 W
Maximum Winds 90 mph
Gusts 115 mph
Movement NW at 27 mph
Minimum Pressure 940 mb (27.75 inches)
Storm Surge Height at Lower Manhattan

Adapted from: Sclerpi and Donnelly, Geochemistry, Geophysics, Geosystems, 2007

- Prior hurricanes:
  - The city is believed to have been directly hit by hurricanes in 1788, 1821 and 1893.
  - 1821 was worst in NYC’s history – 4 m surge, “a wall of water” rising in less than one hour (peaked at low tide), total water level of ~3.25 m.
Tide Data

Preliminary Water Level (E112) vs. Predicted Plot
E58750 The Battery, NY
from 2012/10/29 - 2012/10/30

[Graph showing tide data]

Nearby Stations
- Vinegarbl Bend
- Budget City, FL
- Newburgh, NY
- Peekskill, NY
- New York, NY

Click here for larger plot

Check to plot backup data (if available)

Begin Date: Oct 29 2012
End Date: Oct 30 2012
Datum: MLLW
Data Units: Feet
Time Zone: Local (LST/LDT)

Retrieve data from 20121028 through 20121029
Retrieve data from 20121030 through 20121031
The owner didn’t know – and didn’t care – whether the storm surge was going to be 9.5 feet, or the water level was going to be 14 feet MLLW. What he/she wanted to know was where was the water going to be relative to the dry land surrounding the boat?
船主不知道－也不想知道－是否风暴潮会达9.5英尺，或水位会至平均较低低潮位之上14英尺。他/她只想知道，以船附近的干地作参考，水会涨到哪里？
NYHOPS - Sandy - HRE: Verrazano Narrows to Troy
Is Street-Level Forecasting and Visualization the answer?

Sandy, Spring high tide, ~3.4 m above MSL
Hurricane of 1821, low tide, ~3.0 m above MSL
~2.25 m above MSL

Nor'easter of Dec 11, 1992
Translating Flood Hazards on Google Earth

- Using high-resolution topographic elevation maps as a layer in Google Earth, forecasted flood depths can be mapped in:
  - 1. Horizontal extent on contour maps
  - 2. In depth on Google Street View images

- Consistent datum is important
  - Here we use the North American Vertical Datum of 1988 (NAVD 88)
Google Earth Image of South Tottenville
Manhattan St. looking South from Google Earth Street View
Forecasted Flood Depth

Uncertainty Envelope

Forecasted Water Level +13 NAVD 88

Ground Elevation +8 ft NAVD 88
Why This Matters

这为什么重要
The Earth at Night
Population Density

人口密度
The Bigger Picture

In the year 2000:

- 20% of the world’s population lived within 30 km (walking distance) of the coast
- 40% lived within 100 km (1 hour drive)
- 50% (3.1 billion people) lived within 200 km of the coast
- 11 of the world’s 15 largest cities are located in the coastal zone.
- Global sea level rise and land subsidence are causing coastal sea level rise of approximately 1 foot per 100 years along the US Atlantic and Gulf coasts
- “Humanity is the first species to become a geophysical force.” (E.O. Wilson)
在2000年:

- 20%世界人口住在距海岸线30公里以内（步行距离）
- 40%住在距离100公里以内（一小时车程）
- 50%（31亿人）住在距离200公里以内

- 世界上最大的15个城市有11个在海岸区

- 全球海平面上升和地面沉降正使美国东部和南部的海岸水位以约每百年一英尺的速率上升

- “人类成为第一个能影响地球物理的物种”（E.O. Wilson）
% population living within 200 km of coast (2010)
What’s Next?
下一步?

We – the scientific community – need to work together on an international scale to address two primary needs:

1. Develop guiding principles, supporting data, and design guidelines for Resilient Coastal Urban Communities.

2. Develop more effective ways to Translate scientific information, and Risk and Vulnerability into terms that the public can understand and act on. This will lead to Public Policy informed by new knowledge & better understanding.
Thank you!
谢谢！