



# *Global Climate Change and the U.S. Navy*

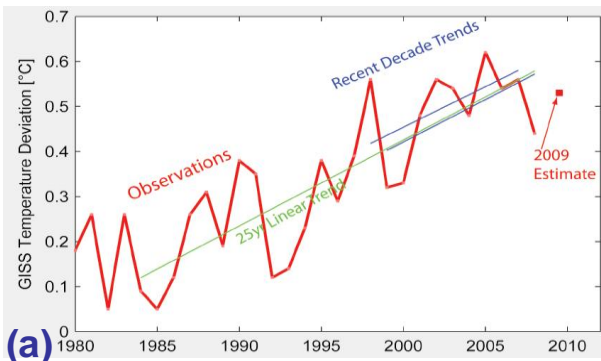


**RADM Dave Titley**  
**Director, Task Force Climate Change / Oceanographer of the Navy**  
**Presentation for the APL-JHU Symposium on Climate and Energy Imperatives for Future Naval Forces**  
**March 23, 2010**



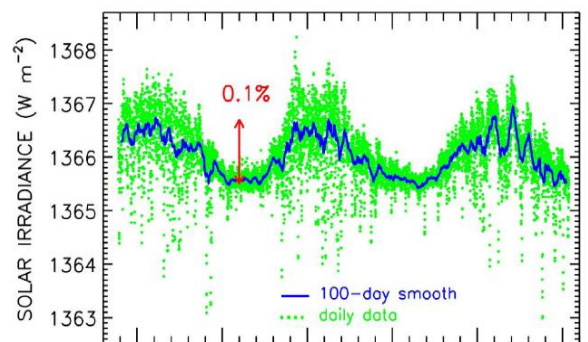
# Climate Change Update

## The Globally Averaged Rate of Warming is NOT Slowing Down



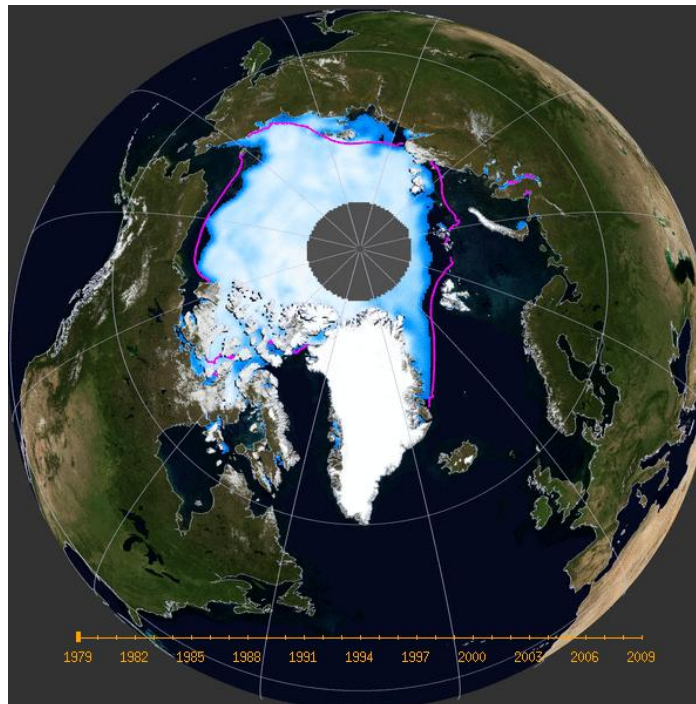
(a)

## Solar Irradiance Trend is Constant



(b)

## Arctic Sea Ice Continues To Melt & Thin



(c)

## Greenland Ice Sheet Mass Loss Is Accelerating

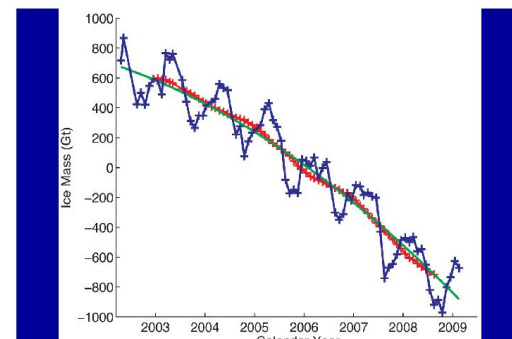


Figure 1 Time series of ice mass changes for the Greenland ice sheet estimated from GRACE monthly mass solutions for the period from April 2002 to February 2009. The best-fitting quadratic trend is shown (green line).  
VELICOGNA 2009

(d)

- (a) UNSW, The Copenhagen Diagnosis, 2009
- (b) C. Frolich and J. Lean, The Astron Astrophysics Review, 2004
- (c) National Snow and Ice Data Center, NASA Earth Observatory, 2009
- (d) I. Velicogna, Geophysical Research Letters, 2009

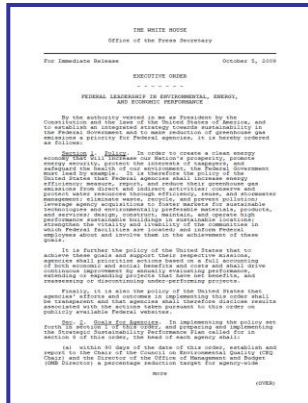


# Drivers

## Navy

## Defense

## National



### Executive Order 13514

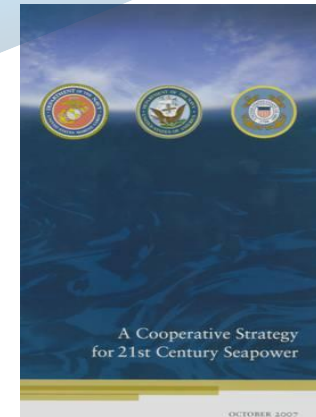
*“Federal Agencies will reduce , monitor, track, & report GHG emissions”*



### 2010 QDR

*“Climate change, energy security, and economic security are inextricably linked”*

*“DOD will work to foster efforts to assess, adapt to, and mitigate the impacts of climate change”*



Maritime Strategy  
*“Climate change is gradually opening up the waters of the Arctic”*

*“These opportunities offer potential for growth, they are potential sources of competition for access and natural resources”*



# Task Force Climate Change

## Establishment

Chief of Naval Operations  
Executive Board on May 15, 2009



## Composition

Navy, NOAA, USCG in core group with  
Joint, interagency, international support



## Charter

Global climate change impacts with near term Arctic focus

**Science-based approach, cooperative partnerships, assess for risk**



# Navy Outreach

## INTERAGENCY

## NATIONAL

## INTERNATIONAL



Engaging across the joint, interagency, and international communities



# Navy Climate Change Concerns

## Near-term

- Increasing Arctic maritime activity
- Partnership opportunities
- Energy security initiatives



## Mid-Term

- Sea level rise impact on installations
- Water/resource challenges
- Potential increase in HA/DR



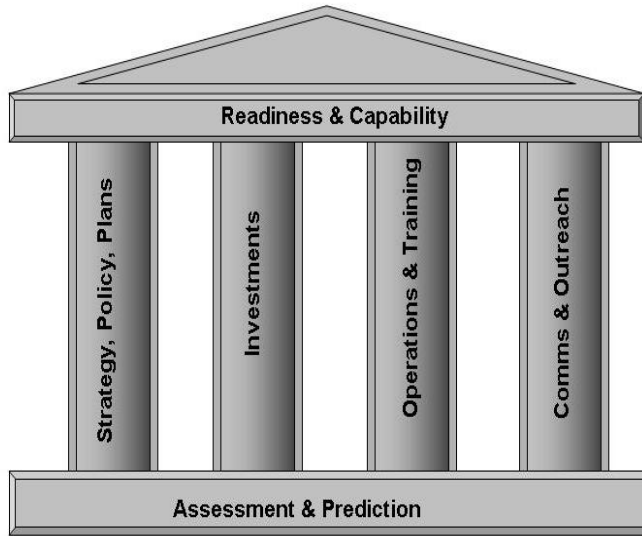
## Wild-cards

- Ocean acidification
- Abrupt climate change



# Navy Arctic Roadmap

## Framework



## Execution

### Phase 1 (FY10)

- Fleet readiness assessment, external studies, strategic implementation plan
- Advocate for UNCLOS\*\*\*\*
- Monitor Polar SATCOM Program\*\*\*\*
- Innovative Readiness Training (IRT)\*\*\*\*
- Arctic TTX & LOE
- Cooperative Navy-NOAA Bering Strait Hydrographic Survey
- POM-12 investments for air-ocean-ice numerical prediction

### Phase 2 (FY11-12)

- POM-14 CBA, NSP, & SPPs address the Arctic
- Formalize expanded / new cooperative partnerships
- Arctic SAREX, Arctic Edge, Northern Edge NANOOK\*\*\*\*
- ICEX-11
- Environmental assessments
- Support National Ocean Policy / Marine Spatial Planning Implementation For Arctic\*\*\*\*
- Interagency partnership for air-ocean-ice numerical prediction

### Phase 3 (FY13-14)

- Execute POM-14
- Implement expanded / new cooperative partnerships
- ICEX-13
- Arctic UUV operations
- Update roadmap ICW QDR

*Navy recognized as a valued joint, interagency, & international partner in the Arctic*

\*\*\*\* Indicates recurring action



# Navy Climate Change Concerns

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## Wild-cards

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# Navy Initiatives

## Task Force Climate Change

### Observation & Prediction



Next Generation Air-ocean-ice numerical prediction



Cooperative Oceanographic Surveys



Remote sensing



Environmental Impact Assessments



### Adaptation

Arctic & Climate Change Roadmaps



Sea level rise Impact modeling



Water resource management

Arctic civil relocation & erosion control



Arctic fleet training

## Task Force Energy

### Energy Efficiency

Smart Grid



Net Zero Installations



Metering & Auditing

Incentivized Conservation



New Construction & Renovation

Training & Awareness



Smart Voyage Planning, & Efficient Aircraft & Ship Systems

### Alternative Energy



Portable Power



Biofuels



Renewable power



Alternative Fuel Vehicles

**Technology and Research to Understand, Predict and Adapt to Climate Change**

**Assure Mobility + Expand Tactical Reach + Lighten the Load = Combat Capability**

**Reduce the Navy Carbon Footprint**



# Questions?

