

*9<sup>th</sup> International Workshop on  
Wave Hindcasting and Forecasting  
Victoria, Canada, September 24-29, 2006*

# JCOMM Wind Waves and Storm Surge Programme



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*World Meteorological Organization*

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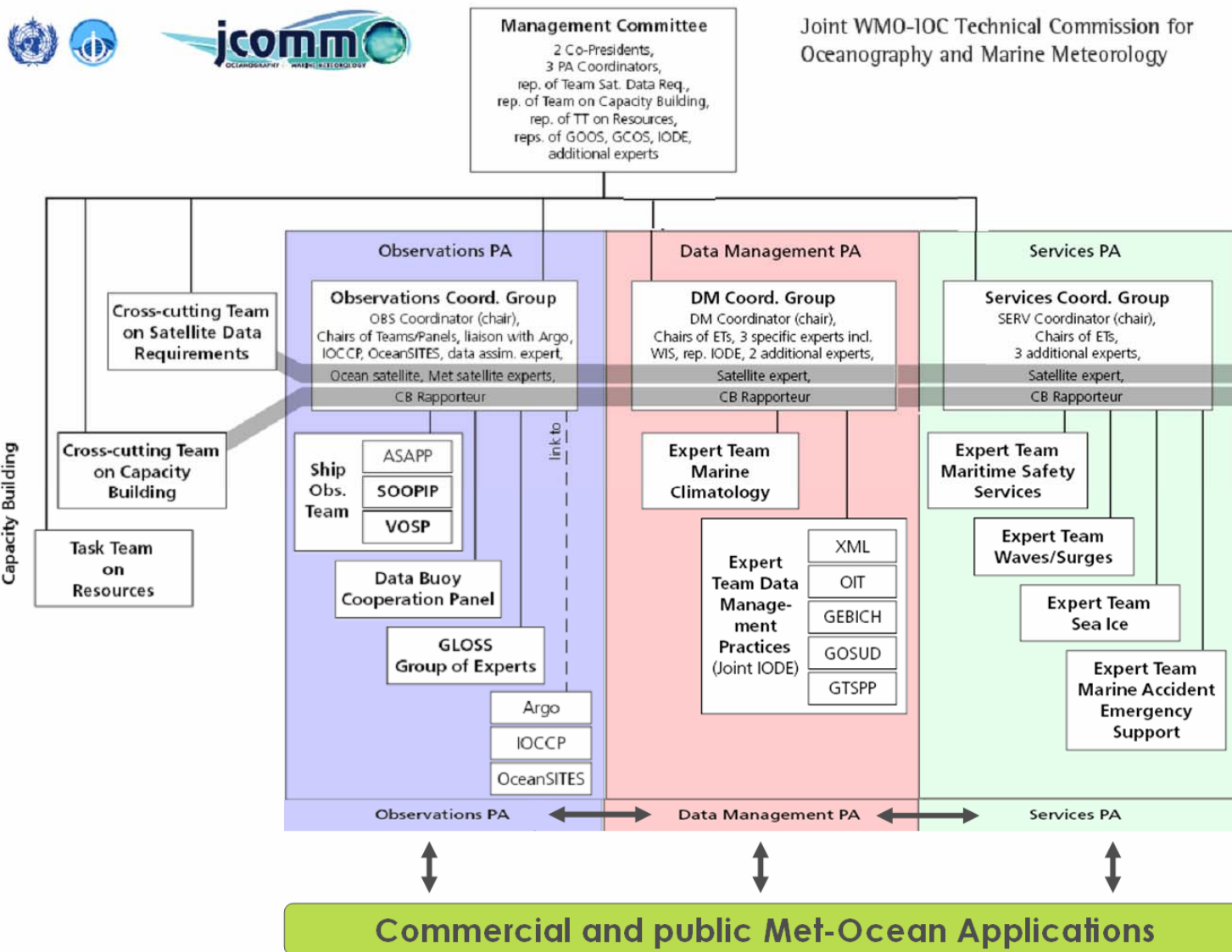
# JCOMM Long-term Strategic Vision

To benefit the global community through international coordination activities, the **development of appropriate technical standards and procedures** for a fully integrated met-ocean observing, data management and services system

# JCOMM promotes:

- A state-of-the-art globally distributed and interconnected system based on present and next-generation technologies and capabilities
- The implementation of an outreach programme to enhance the national capacity of all maritime countries to work effectively for the maritime community and the management of the marine environment

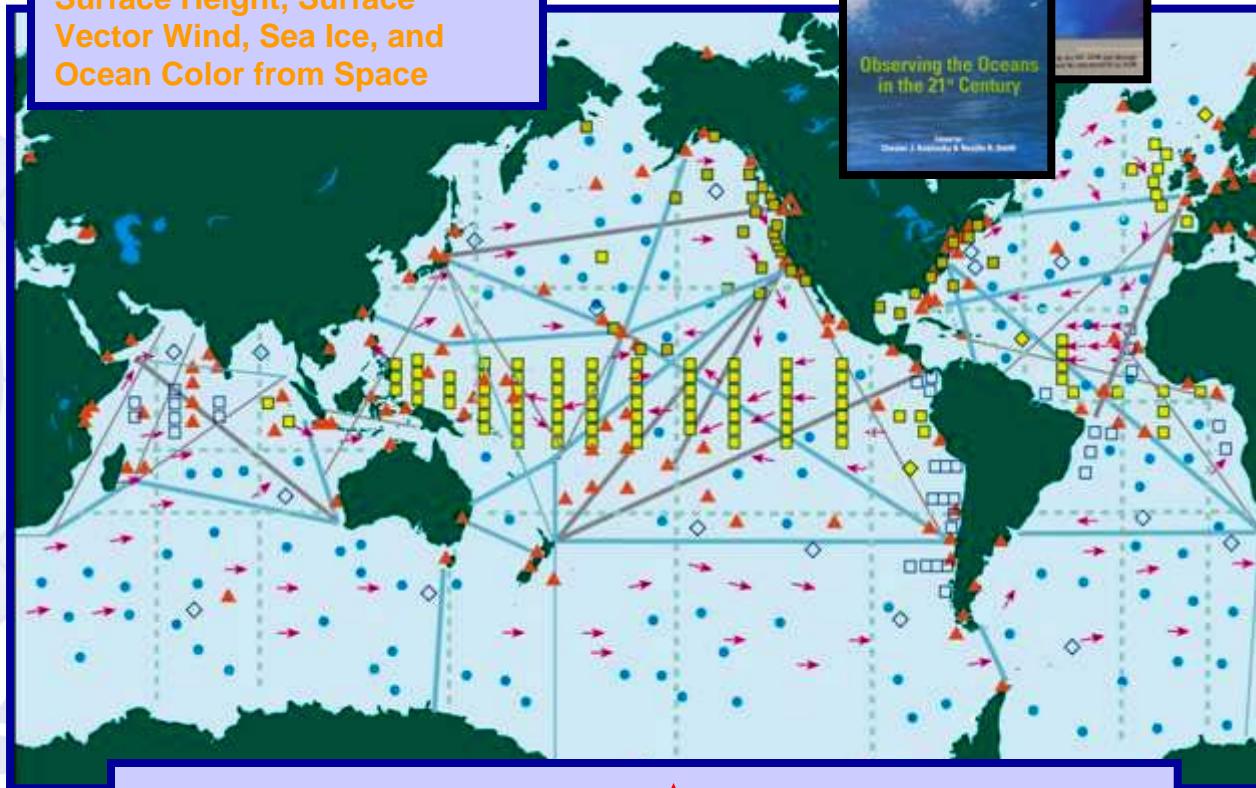
# Formal JCOMM Structure



# Global Ocean Observing System for Climate Now 55% complete.

Sea Surface Temperature, Sea Surface Height, Surface Vector Wind, Sea Ice, and Ocean Color from Space

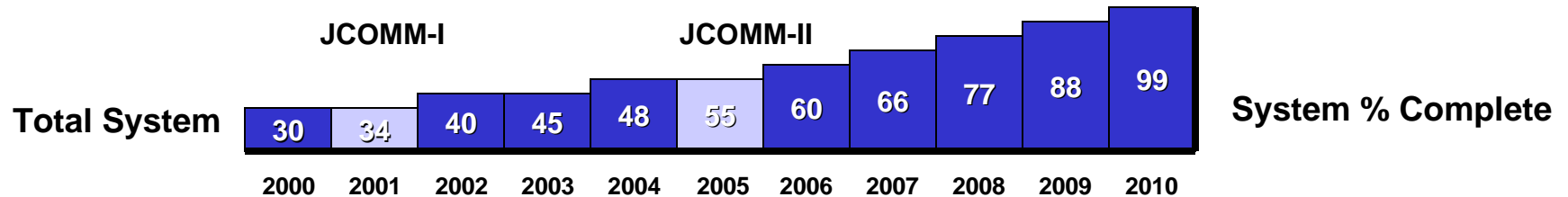
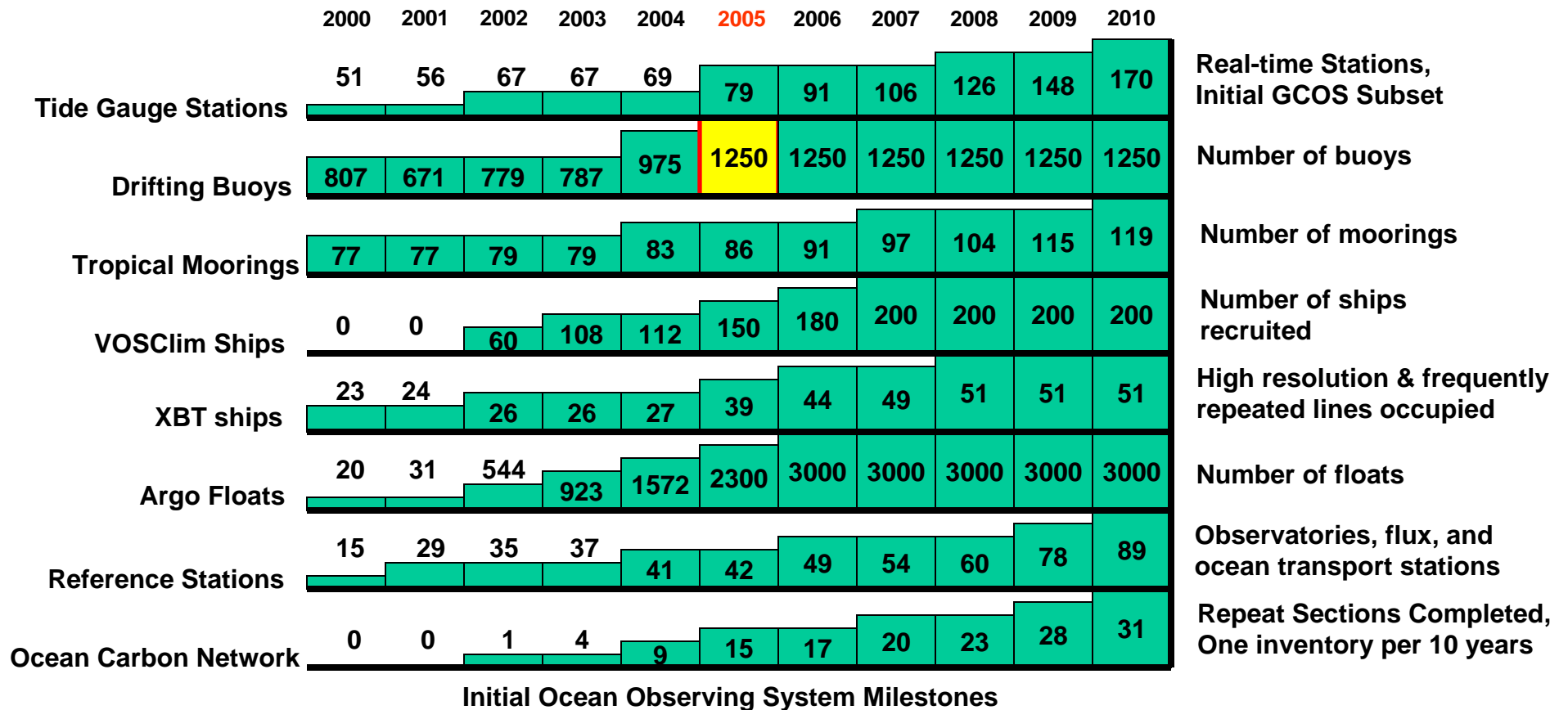
GCOS-92



- |                                    |                            |
|------------------------------------|----------------------------|
| Tide Gauge Network                 | ▲ 58% complete             |
| 3°x3° Argo Profiling Float Array   | ● 71% complete             |
| 5°x5° Surface Drifting Buoy Array  | ← 100% complete            |
| Moored Buoy                        | ■ Existing    □ Planned    |
| Ocean Reference Station            | ◆ Existing    ◇ Planned    |
| High Resolution XBT and Flux Line  | ■ Existing    □ Planned    |
| Frequently Repeated XBT Line       | ■ Existing    □ Planned    |
| Carbon Inventory & Deep Ocean Line | ■ Existing    □ Planned    |
|                                    | ■ Global Survey @ 10 years |

# Multi-year Phased Implementation Plan

(representative milestones)



Capacity Building

Data Management

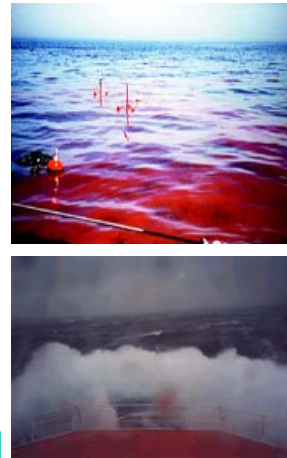
Observations



Products



Services



Climate



Users

# Services Programme Area

***To coordinate and facilitate the sustained provision of global and regional coverage data products and services to address the continued and expanding requirements of the maritime user community for marine meteorological and oceanographic services and information.***

# Services Programme Area

- Expert Team on Maritime Safety Services (ETMSS)
- Expert Team on Marine Accident Emergency Response (ETMAES)
- Expert Team on Wind Waves and Storm Surges (ETWS)
- Expert Team on Sea Ice (ETSI)
- Task Team on Ocean Products Development

# JCOMM WWSS Programme

- WMO Wave Programme was proposed at CMM-VIII (1981)
- WMO Wave Programme came to existence in 1984

To help Members in the provision of high quality data as well as wave analysis and forecast services to a large variety of applications including highly specialized activities

# JCOMM WWSS Programme

- *Ad hoc* Group on Wave Modelling was established by CMM-X – Res. 5 (1990)
- CMM Subgroup on Wave Modelling and Forecasting was established by CMM-XI – Res. 3 (1993)
- The WMO Wave Programme was transformed into the **JCOMM Wind Waves and Storm Surges Programme** by JCOMM-I (2001)
- The **Expert Team on Wind Waves and Storm Surges (ETWS)** was established by JCOMM-I (2001)

# Expert Team on Wind Waves and Storm Surge Terms of Reference

The Expert Team on Wind Waves and Storm Surge shall:

- Review and advise on the implementation of wind wave and storm surge activities within JCOMM and propose amendments as required;
- Develop technical advice on wave and storm surge modelling, forecasting and service provision and provide assistance and support to Members/Member States as required;
- Interact closely with ETMSS on all aspects of sea state and surge forecasting relevant to the operation and improvement of maritime safety services;
- Monitor projects for verification of operational wind wave and storm surge model outputs and assist in their implementation as required;
- Ensure effective coordination and cooperation with other WMO and appropriate GOOS bodies, particularly on requirements for, and implementation of, wind wave and storm surge products and services;
- Provide advice to the Services CG and other Groups of JCOMM, as required on issues related to wind waves and storm surges.

# ETWS Membership

## Val Swail

María Paula Etala  
Graham Warren  
Yu Zhouwen  
Jean-Michel Lefèvre  
Gudrun Resenhagen  
Masakazu Higaki  
Hans de Vries  
Jang-Won Seo  
Igor Lavrenov  
Kevin Horsburgh  
Martin Holt  
Hendrik Tolman

## Canada (chairperson)

Argentina  
Australia  
China  
France  
Germany  
Japan  
Netherlands  
Republic of Korea  
Russian Federation  
UK  
UK  
USA

# ETWS Key Activities

- Continued and expanded the global wave model forecast verification exchange project
- Initiated investigation of feasibility of including wave measurements on Ocean Time Series platforms
- Developed questionnaires to produce the dynamic part of the Guides on:
  - Use of satellite data in operational wave forecast models
  - Operational wave and storm surge models
  - Measured and hindcast wave data bases
  - Measured storm surge data bases

# Publications

## Guides

- Guide to Wave Analysis and Forecasting (WMO-No. 702) online
- Framework developed for online dynamic part of the Guide
- Framework developed for Guide to Storm Surge Forecasting and Table of Contents produced

## Technical Reports (TR)

- TR on verification of operational wind wave forecast models verification program produced
- TR on assimilation of satellite data into wind and wave models nearing completion
- TR on variations of long return period waves caused by climate trends and variability nearing completion
- Article on the ERA40 Global Wave Climatology Atlas published in WMO Bulletin and CLIVAR Exchanges
- Proceedings and Presentations from 8<sup>th</sup> Wave Workshop produced for CD-ROM and dynamic part of Guide

# Relationship with other Programmes and Technical Commissions (TC)

- Interactions with CIMO, CCI, TCP
  - Instrument testing
  - Marine climate
  - Storm surges
- Joint TC activities (primarily CAgM and CHy plus some RAs)
  - Marine Impacts on coastal Lowland Agriculture and Coastal Resources (MILAC)

# Capacity Building Activities

- Workshop on Wind Waves and Storm Surges for Caribbean Countries – June 2003 – Dartmouth, Canada
- CLIMAR-II Workshop on Advances in Marine Climatology – November 2003 – Brussels, Belgium
- 8<sup>th</sup> International Workshop on Wave Hindcasting and Forecasting – November 2004 – North Shore, Oahu, Hawaii
- **9<sup>th</sup> International Workshop on Wave Hindcasting and Forecasting – September 2006 – Victoria, Canada**

# Future Meetings

September 2006  
**9<sup>th</sup> Waves Workshop**  
Victoria, Canada

January 2007  
MSS-II and MAES-I  
Angra dos Reis, Brazil

March 2007  
**WWSS-II, MC-II and SI-III**  
Geneva, Switzerland

November 2006  
**SCG-III**  
Exeter, UK

October 2007  
**Storm Surge Symposium**  
Seoul, Korea

April/May 2008 (tentative)  
**CLIMAR-III**  
Warsaw, Poland

October 2008  
**International Maritime MetOcean  
Services Conference**  
Exeter, UK

November 2008  
**10<sup>th</sup> Waves Workshop**  
Hawaii

**JCOMM-III**

October  
2009

# Key Activities for the current intersessional period (2005-2009)

- Develop the **Guide to Storm Surge Forecasting**
- Continue expanding the **operational wave forecast verification** project
- Develop and update the **dynamic part of the Guide to Wave Analysis and Forecasting**
- Complete Technical Reports on **assimilation of satellite data, wave climate effects on design criteria and review of boundary layer wind fields**
- Develop a **statement of requirements for wave observations**
- Develop **archive of extreme wave events with ETMC**

# CHANGE OF SPEAKER



or



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# JCOMM Extreme Waves Data Base



**Val Swail**

*Chair*

*Expert Team on Wind Waves and Storm Surge*

# JCOMM EXTREME WAVE DATA BASE

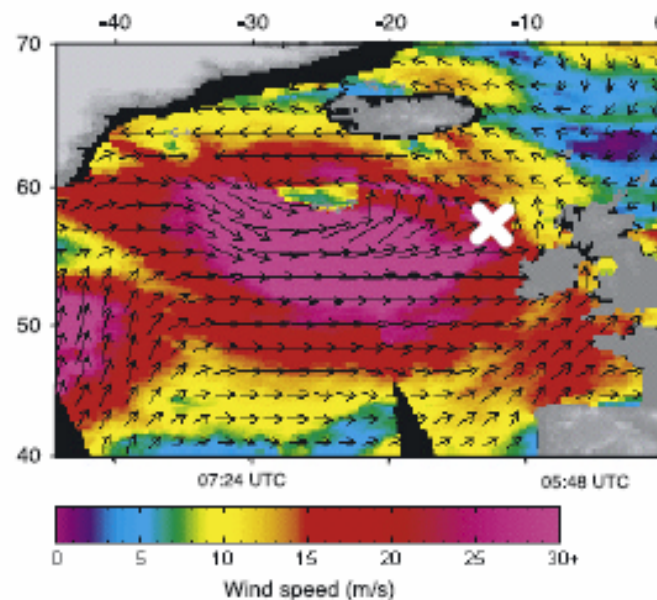
**Motivation:** JCOMM Expert Team on Wind Waves and Storm Surges noted the need for high quality measured wave data sets in areas of open ocean away from continental margins for use in model validation, forecast verification, satellite calibration and validation as well as climatology

**Proposal:** JCOMM supported the development of a JCOMM-label data base of wave measurements in “extreme storm seas”,  $\text{SWH} \geq 14 \text{ m}$

**Catalyst:** Rockall Trough storm of February 8, 2000 measured **18.5 m SWH (!!)**, the largest known reliably measured wave height, off Scotland

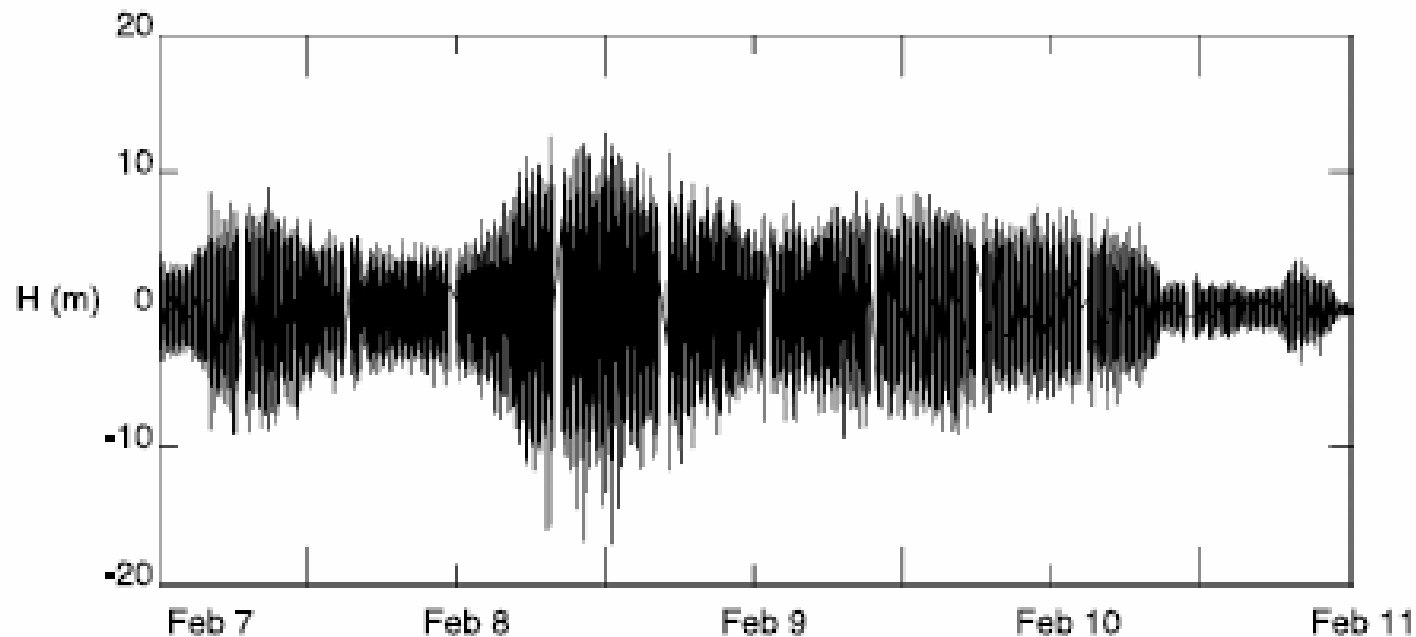
Holliday, N. P., M. J. Yelland, R. Pascal, V. R. Swail, P. K. Taylor, C. R. Griffiths, and E. Kent, 2006: Were extreme waves in the Rockall Trough the largest ever recorded?, *Geophys. Res. Lett.*, 33, L05613, doi:10.1029/2005GL025238.

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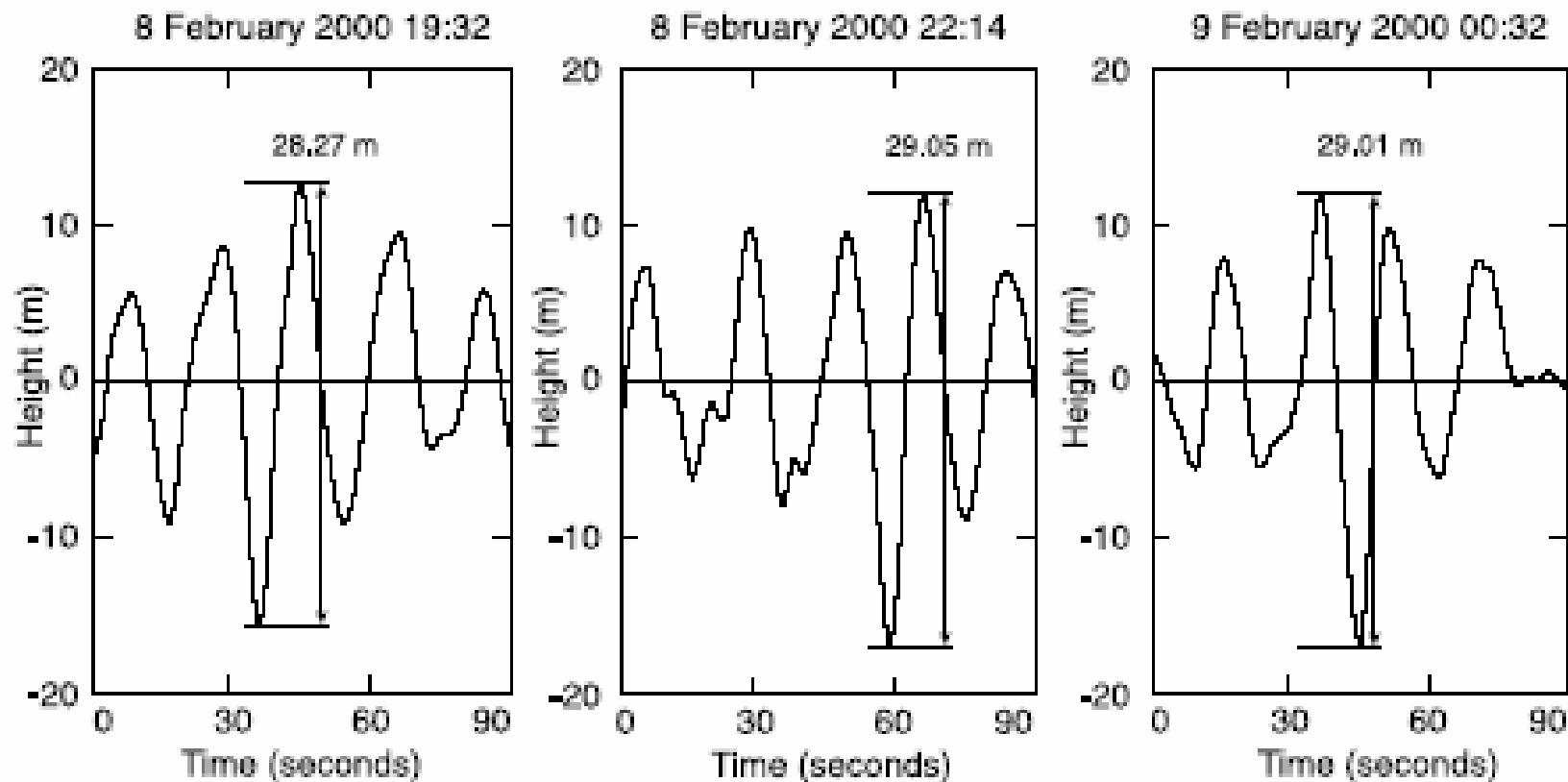
**Figure 1.** The location of RRS *Discovery* on 8 February 2000 (white cross), overlying the satellite-derived wind speeds for that day (QuikScat morning pass wind vectors). QuikScat data are produced by Remote Sensing Systems and sponsored by the NASA Ocean Vector Winds Science Team. Data are available at <http://www.remss.com> (2005). Grey shading is land; black shading represents no data.

Holliday et al., 2006. Were extreme waves in the Rockall Trough the largest ever recorded?, *Geophys. Res. Lett.*, 33, L05613



**Figure 3.** The individual wave record for 7–11 February 2000. Data recorded at 1 second intervals with 10-minute breaks every 8 hours while data were saved.

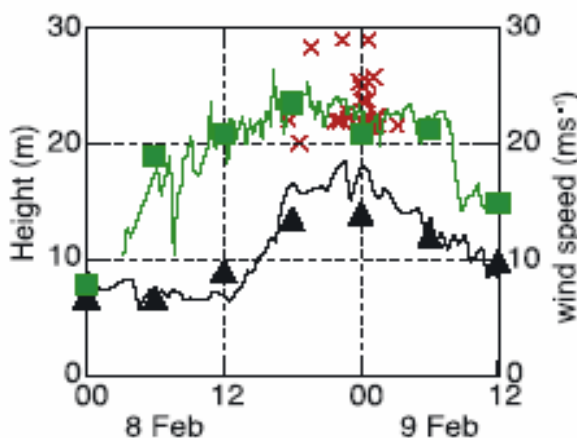
Holliday et al., 2006. Were extreme waves in the Rockall Trough the largest ever recorded?, *Geophys. Res. Lett.*, 33, L05613



**Figure 4.** The wave records for the three largest measured individual waves.

Holliday et al., 2006. Were extreme waves in the Rockall Trough the largest ever recorded?, *Geophys. Res. Lett.*, 33, L05613

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**Figure 2.** Extreme wind and waves recorded by RRS *Discovery* on 8–9 February 2000 at 57.5°N 12.7°W. Black line is significant wave height (defined as four times the standard deviation of sea surface elevation). Green line is wind speed when the wind direction was within  $\pm 30^\circ$  of the bow (10 minute averages of true wind corrected for stability and at a height of 10 m). Red crosses are individual wave heights that exceeded 20 m. AES40 hindcast data for the same period at 57.5°N 12.5°W are given as black triangles (significant wave height) and green squares (neutral wind speed at 10 m).

Holliday et al., 2006. Were extreme waves in the Rockall Trough the largest ever recorded?, *Geophys. Res. Lett.*, 33, L05613

# JCOMM EXTREME WAVE DATA BASE

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**Proposal:** JCOMM supported the development of a JCOMM-label data base of wave measurements in “extreme storm seas”, SWH  $\geq 14$  m

**Catalyst:** Rockall Trough storm of February 8, 2000 measured **18.5 m SWH (!)**, the largest known reliably measured wave height, off Scotland

**Requirement:** *Contributions of high quality wave measurements of extreme storm seas with appropriate documentation and metadata to the JCOMM data base*

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# Rogue wave off of Charleston, South Carolina



# Fishing vessel in heavy seas











# Nov 07 2001 - Coastal Impacts PEI



Photo Credits: George Parkes, EC

# L'Aboiteau



Photo credit: Mike Campbell



Photo credit:









WMO  
OMM



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THE END

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