



International  
Association  
of Oil & Gas  
Producers

IOGP / JCOMM / WCRP Workshop

# Our Future Climate

## Understanding the spread of physical risk

*Metocean Committee  
Perspectives*

September 25-27, 2018

# IOGP Metrocean Committee

- Composed of representatives from member companies
- Promotes use of sound metrocean techniques in support of offshore and onshore facilities design and operation
- Leads industry efforts to frame and conduct studies to address gaps / uncertainties in criteria and forecasting capabilities

## Upstream members

- Assala Energy
- Abu Dhabi National Oil Company (ADNOC)
- Aker BP
- Anadarko Petroleum Corporation
- BHP
- BP plc
- Capricorn (Caim Energy)
- CC Energy Development
- CEPSA EP
- Chevron Corporation
- CNOOC Limited/Nexen
- ConocoPhillips
- DEA Deutsche Erdöl AG
- Dolphin Energy Ltd
- Dragon Oil
- eni SpA
- Equinor
- ExxonMobil
- GALP Energia, SA
- GeoPark
- Gulf Keystone Petroleum
- Hess Corporation
- Husky Oil Operations Ltd
- INEOS DENOS
- INPEX Corporation
- KazMunayGas
- Kosmos Energy
- Kuwait Oil Company
- Maersk Oil og Gas AS
- MOL Group
- Neptune Energy
- North Caspian Operating Company (NCOC)
- North Oil Company
- Oil Search Ltd
- OMV
- Origin Energy
- Pan American Energy
- Petróleo Brasileiro SA (Petrobras)
- PETRONAS Carigali Sdn Bhd
- PGNiG
- PLUSPETROL SA
- Premier Oil
- PTT Exploration and Production Public Company Ltd (PTT EP)
- Qatargas
- Qatar Petroleum
- Repsol
- Sasol
- Saudi Aramco
- Shell International Exploration & Production BV
- SOCAR
- Sonangol EP
- Suncor
- Total
- Tullow Oil
- Wintershall Holding GmbH
- Woodside Energy Ltd
- YPF SA
- Zakum Development Company (ZADCO)

## National and other associations

- American Petroleum Institute (API)
- ASSOMINERARIA
- Australian Petroleum Production & Exploration Association (APPEA)
- Bundesverband Erdgas, Erdöl und Geoenergie e.V. (BVEG)
- Canadian Association of Petroleum Producers (CAPP)
- Consejo Colombiano de Seguridad (CCS)
- Energy Institute (EI)
- HeliOffshore
- Instituto Brasileiro de Petróleo, Gás e Biocombustíveis (IBP)
- International Association of Drilling Contractors (IADC)
- International Association of Geophysical Contractors (IAGC)
- IPIECA
- Irish Offshore Operators' Association (IOOA)
- Netherlands Oil and Gas Exploration and Production Association (NOGEPa)
- Norwegian Oil and Gas
- Oil Gas Denmark
- Oil & Gas UK
- Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean (ARPEL)

## IOGP Associate Members

- Aker Solutions
- Baker Hughes, a GE Company
- Cansco International Corporation
- OPITO
- Schlumberger

# Industry Scope



- O&G Industry operates globally, on land and in the world's oceans
  - Upstream: exploration and production
  - Downstream: refining / product distribution
- Major infrastructure includes onshore fields, offshore platforms, refineries, marine terminals, pipelines and support structures
- Operations include exploration, drilling, production, major construction / installation efforts, storage and transportation of hydrocarbons

# Environment Design and Operating Criteria



- Environment controls design extremes and operating conditions
  - Criteria often set from historical data sets, typically 30-50 years
  - Facility lives are typically 20-30 years, some 40+
- Concerns:
  - Stability of design criteria / changes in facility risk (hazard curve shifts)
  - Long-term changes in operating conditions / reductions in efficiency / reduced operating windows

# 2008 Workshop



OGP/JCOMM/WCRP Workshop on Climate Change and the Offshore Industry

WMO Headquarters, Geneva, Switzerland

27-29 May 2008

- Joint workshop held in 2008; offshore focus
- Sought to review state on knowledge / effects of climate change on:
  - Tropical & extra-tropical storms
  - Sea ice coverage / thickness
  - Monsoon intensity / duration
  - Sea level
- Noted limitations / uncertainties on many projections
- Made recommendations for further studies / O&G-climate science community collaboration

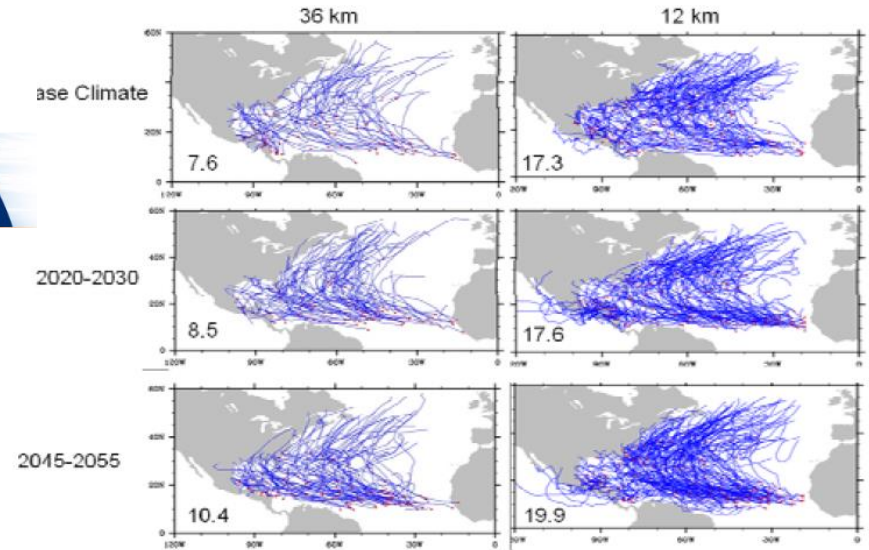
# Select Collaboration Since...



The Global Ocean Observing System



IOOS | Integrated Ocean Observing System



- O&G industry support for data collection / OOS efforts
- Support / collaboration on climate modelling:
  - CASE-EJIP / RPSEA, assessment of hurricanes and global warming / North Atlantic
  - Shell / UKMet, regional climate variability reviews
  - Total / IRD, water balance / management studies

# Now, 10 years later...



- Much more measured data is available, QC efforts on older sets
- Climate modelling techniques / capabilities have continued to grow and evolve
- Can we once again review:
  - *What is changing, by how much, and over what time scales?*

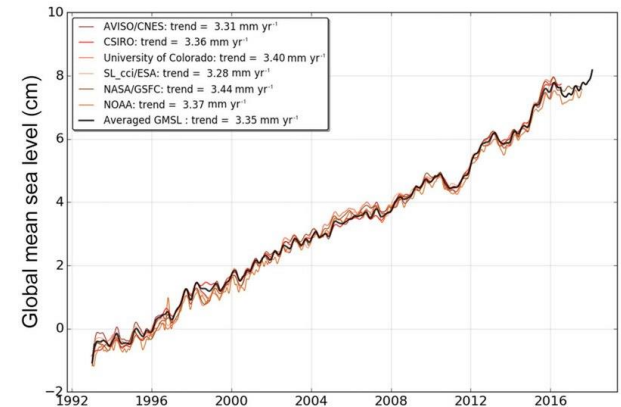
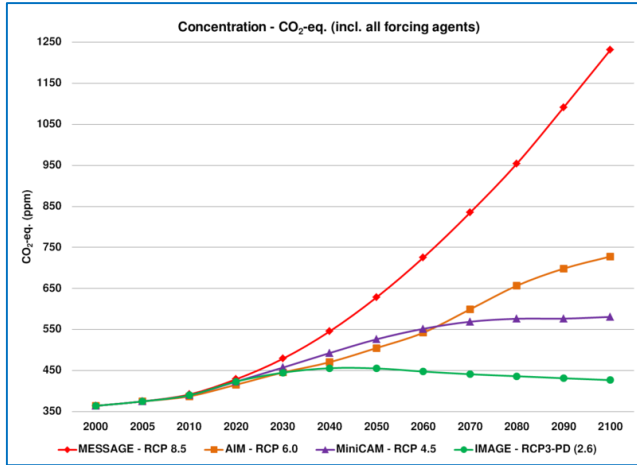
# Key Workshop Themes and Questions...



- How has our understanding of changes and model projections evolved since 2008?
- What is current “best practice”, including the most appropriate models, downscaling approaches and analysis techniques?
- Is current practice at a state where it can be relied upon for long-term business decisions?
- What are the recognized gaps and uncertainties in current practice – and what needs to be done to address?

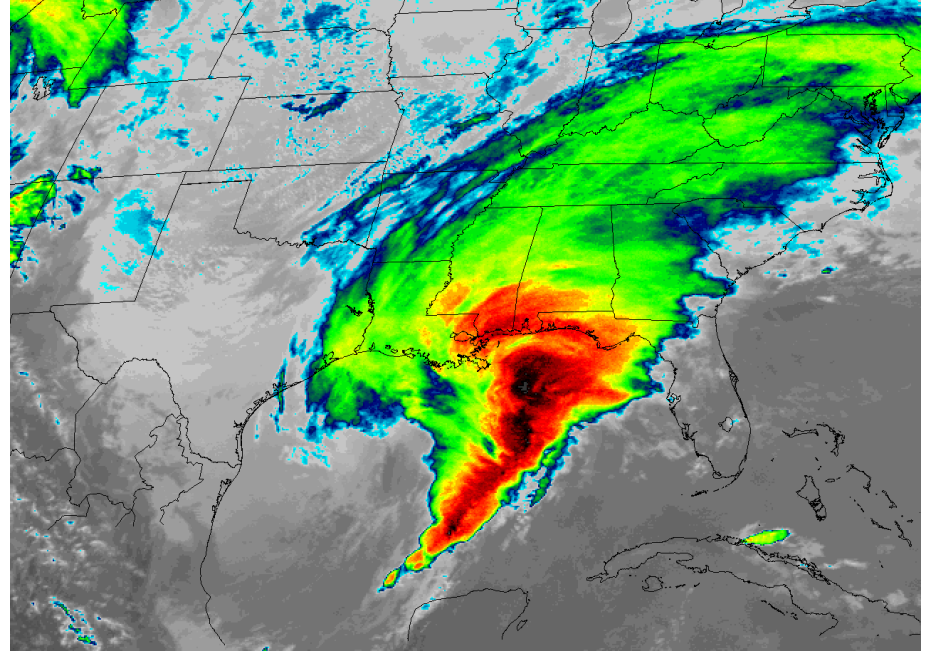


# Topics #1



- Emissions Scenarios
- Air and Seawater Temperatures
- Sea Level Rise / Ice Coverage

# Topics #2



- Changes in storminess (tropical / extra-tropical)

# Topics #3



- Rainfall and Flooding
- Drought, Wildfires, Water Availability

# Over the next three days...



- Review the latest science / state of the art
- Get topic “key questions” answered
- Identify consensus trends / best practices / where significant uncertainty remains
- Identify outstanding gaps in projections / what is needed to close
- Identify ways the industry can continue to best collaborate with the climate community on future efforts

# A vision of the future...



- Understand background variability vs. mean trends
- Understand stability of hazard curves over increasing time scales / minimize associated uncertainty
- Improved forward-looking projections / modeling for development of future design / operating conditions

# Acknowledgement... Chris Graham

- 28 years with Shell (retired), previously with MAREX
- Active industry leader of many JIPs / initiatives
- Metocean chair / key organizer of 2008 OGP-JCOMM-WCRP workshop

