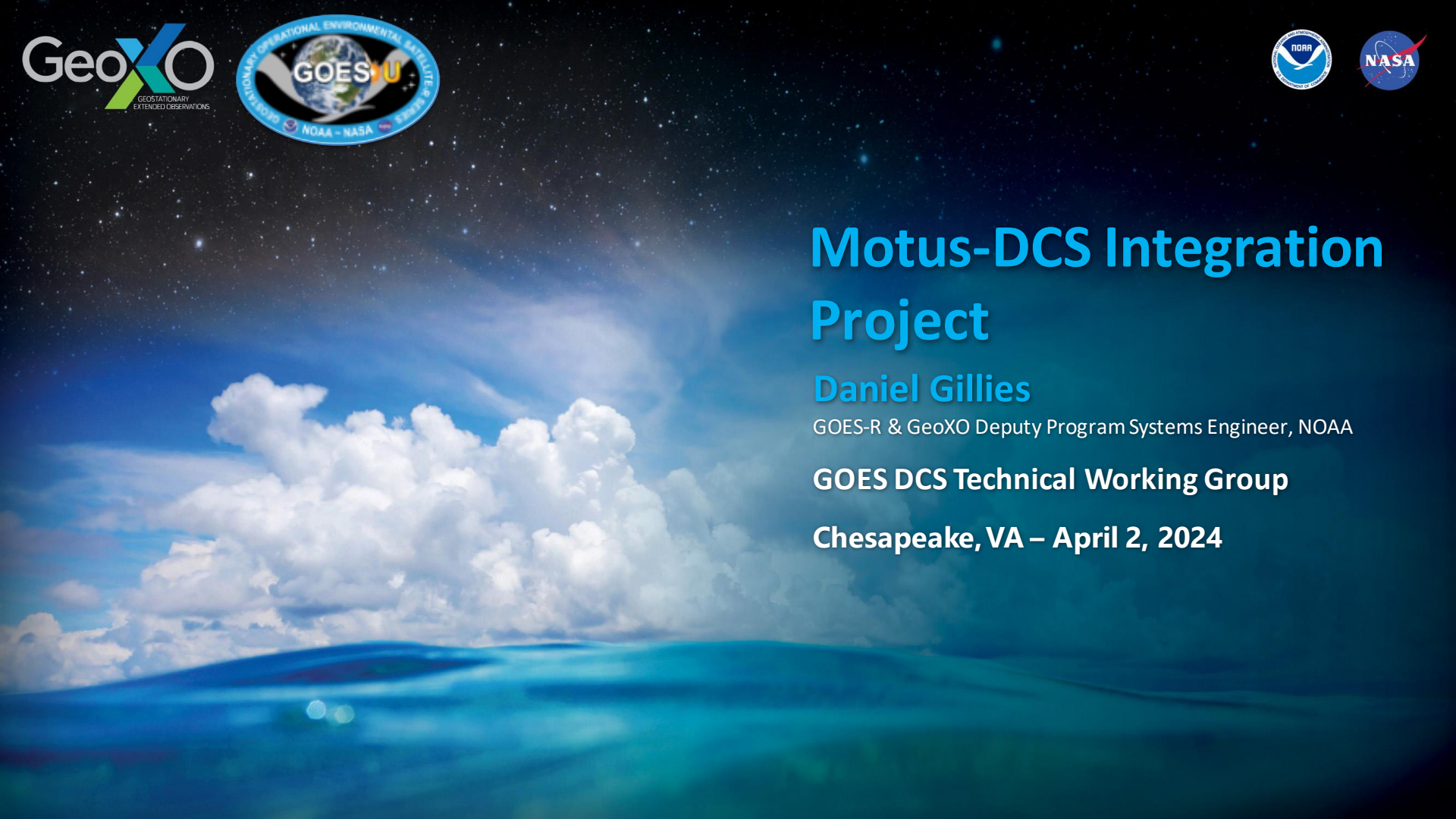

Motus-DCS Integration Project

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GOES DCS Technical Working Group

Chesapeake, VA – April 2, 2024

Project Overview

The MOTUS / DCS Integration Project is a NOAA NESDIS Joint Ventures effort to enable the integration of MOTUS radio receiver base stations into GOES DCS DCPs to enable connectivity in offshore environments, with a specific application in monitoring the interactions of migratory birds and offshore wind developments, which have a requirement from BOEM to incorporate such technologies.

The project also addresses enablement of offshore use of DCPs, such as in the wind farm environment or on buoys, allowing for further distribution of offshore MOTUS systems. This work will directly benefit not only researchers monitoring environmental impacts of windfarms on migratory bird behavior, but also advance technologies that can be used by other DCS others to operate DCPs offshore in a reliable, consistent and sustainable manner.

NOTE: **USFWS leads the MOTUS for Offshore Wind Project**. NOAA is contributing to technology development and integration in support of the use of GOES for that application. The subsequent WBS is from the perspective of the NOAA funded and lead elements of the project related to DCS.

Main Project Objectives

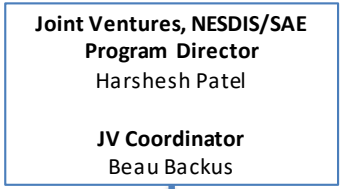
- **Integrate MOTUS Receivers / Base Stations to a GOES DCP to enable DCS-based MOTUS data transmission**
  - Manufacturer agnostic → Support multiple DCP data interfaces
  - Enable easy conversion of file-based data to DCS compatible telemetry stream
- **Perform MOTUS-DCP Field Testing to Validate Technology**
- **Enable use of GOES DCS on offshore buoys in a reliable, sustainable manner (to support MOTUS & other environmental sensing applications)**
  - Investigate / develop new technologies for SNR-challenged environments
    - DCP Protocols
    - DCP Hardware
    - Antenna & Amplifier Solutions
  - Build on prior off-shore DCS lessons learned to develop enhanced offshore DCP to enable use for multiple applications and users (MOTUS, NOS, NDBC, etc)

Motus Hardware

Example of a Terrestrial Motus Station
https://www.fws.gov/story/2023-05/motus-stations

Example of a Motus Telemetry Tag
https://www.fws.gov/story/2024-03/where-do-birds-go-offshore-answers-may-be-blowing-wind

Project Breakdown for MOTUS-DCS Integration Project



- Application of MOTUS to Wind Farm / Migratory Bird Interaction
- Open Source MOTUS Receivers for DCS Compatibility
- MOTUS Data Workflow (Tag->Receiver->DCS-->MOTUS Databases)
- Science
- Field Testing of Integrated System
- MOTUS & Supporting Hardware Procurement

Open Source Tag / Receiver Development
Daniel Deng, DoE/PNNL

- Apply DCS/DCP expertise to integrate MOTUS receivers to DCPs
- Develop / integration MOTUS to DCP data handling
  - File to DCS Telemetry Stream
  - Direct MOTUS Telemetry to DCS Integration
- Provide expertise in DCP deployment for development of fieldable integrated MOTUS-DCP System
- Support field testing of integrated MOTUS/DCP hardware
  - Terrestrial & Marine
- DCP, Motus & Supporting Hardware Procurement

- Investigation of enabling technologies to enable DCP performance in low SNR environments
  - Reed-Solomon Encoding
  - Application of DCPC FHSS Technology to DCPR
- Procurement of development services through DCS contractor

- Provide Lessons Learned in DCP Offshore Operations
- Support field testing of enhanced DCP technologies on a buoy environment