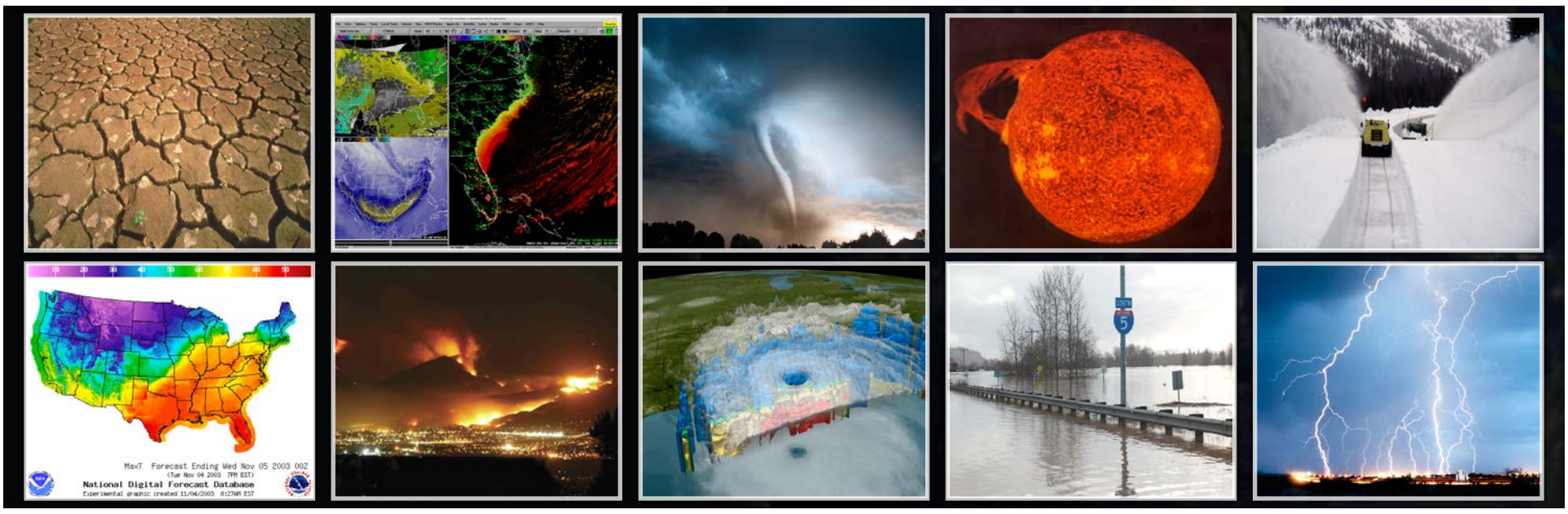
R2O2R2O2R2O2R2O2R2O2R2O2R2O……
The NOAA Perspective



Dr. William M. Lapenta
Director, National Centers for Environmental Prediction
NOAA/National Weather Service
O2R Space Weather Workshop
16 August 2016

Things to Consider…..

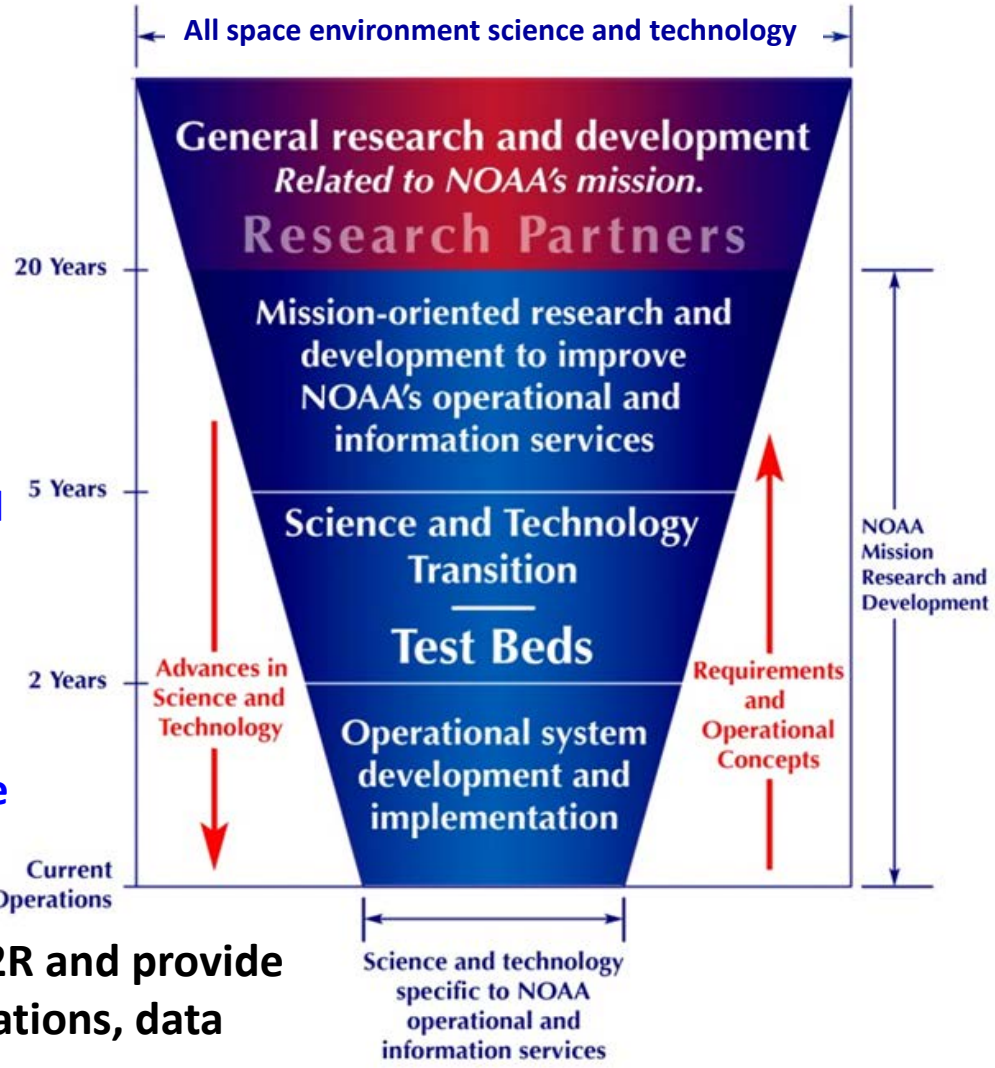
- **Why are people passionate about research to operations and operations to research?**
- **Perspectives Requested:**
  - **Operations**
  - **Federal**
  - **Academia**
  - **Private Sector**
- **Metrics for Success?**
- **Governance of the process required**

[SWAP Action 5.6]

Example: The NOAA Research to Operations Funnel

Basic Research Applied Research Operations

- **The R2O Funnel:**
  - Enhances the transfer of scientific advances and technology into operational and information services
  - Leverages research and development from multi-agency programs
  - Establish and improve operational observations and modeling/prediction systems
  - Enables NOAA operational requirements and concepts to inform research priorities atop the funnel



To accelerate R2O, need to support O2R and provide research access to operational observations, data assimilation and modeling system.

Example of Successful R2O2R:

The NOAA Hurricane Forecast Improvement Project

Scope:

- Improve hurricane forecast system/global forecast system to reduce error in intensity and track
- Make better use of existing observing systems; define requirements for future systems to enhance research and operations capabilities and impacts
- Expand and improve forecaster tools and applications to add value to model guidance

Vision

- Organize the hurricane community to dramatically improve numerical forecast guidance to NHC in 5-10 years

Goals

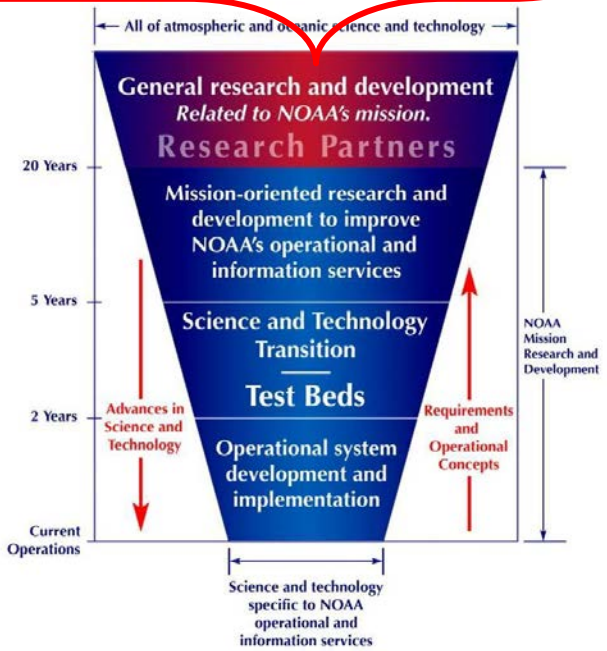
- Reduce numerical forecast errors in track and intensity by 20% in 5 years, 50% in 10 years
- Extend forecast guidance to 7 days with today's skill at 5 days
- Increase probability of detecting rapid intensification at day 1 to 90% and 60% at day 5

Placing HFIP into the Funnel….

HFIP Teams	Members	Institutions	HFIP Teams	Members	Institutions
Global Model/Physics	8	4	Verification	10	8
Regional Model/Physics	12	5	Applications Development and Diagnostics	13	7
Ensembles	5	3	Hurricane Observations	10	9
Data Assimilation/Vortex Initialization	8	5	Ocean/Wave Model	5	5

Role of the Teams

- Each year develop an overall plan for the team's component of the HFIP Program
  - Ø Needs to be coordinated with:
    - v Other team plans
    - v Across the various organizations **(13 total)**
- Role of Team lead
  - Ø Provide summaries of progress (like the summaries this summer during the HFIP calls)
  - Ø Lead the development of the program plan for the team
  - Ø Lead the coordination across teams and organizations



What made HFIP successful in my opinion….

- **The Project itself:**
  - Project has clear vision and goals
  - Designed to improve operational guidance and forecasts
  - Annual budget
  - Solicited competitive proposals for community to participate
  - Targeted operational system improvement

- **The people that made it work:**
  - Leadership at ALL levels of the project
  - People working together to achieve a common goal
  - Researchers contributed to and participated in the HWRF development cycle
- **ALIGNMENT between research and operations!**

[SWAP Action 5.6.2]

Challenges to the O2R action in SWAP 5.6.2

- Space weather models are largely developed outside of federal labs by academia unlike terrestrial weather prediction models
- Majority of space weather models are owned by the research community or private industry and are not developed as community codes and often contain proprietary restrictions on use
- Models transitioned to operations at SWPC are difficult to upgrade after implementation due to lack of community access to operational code base
- NOAA has no direct line of funding to the research community for work on operational code base: no analog of terrestrial R2O facilities (JCSDA) exists for space weather