



NOAA

Accelerating Research-to-Operations

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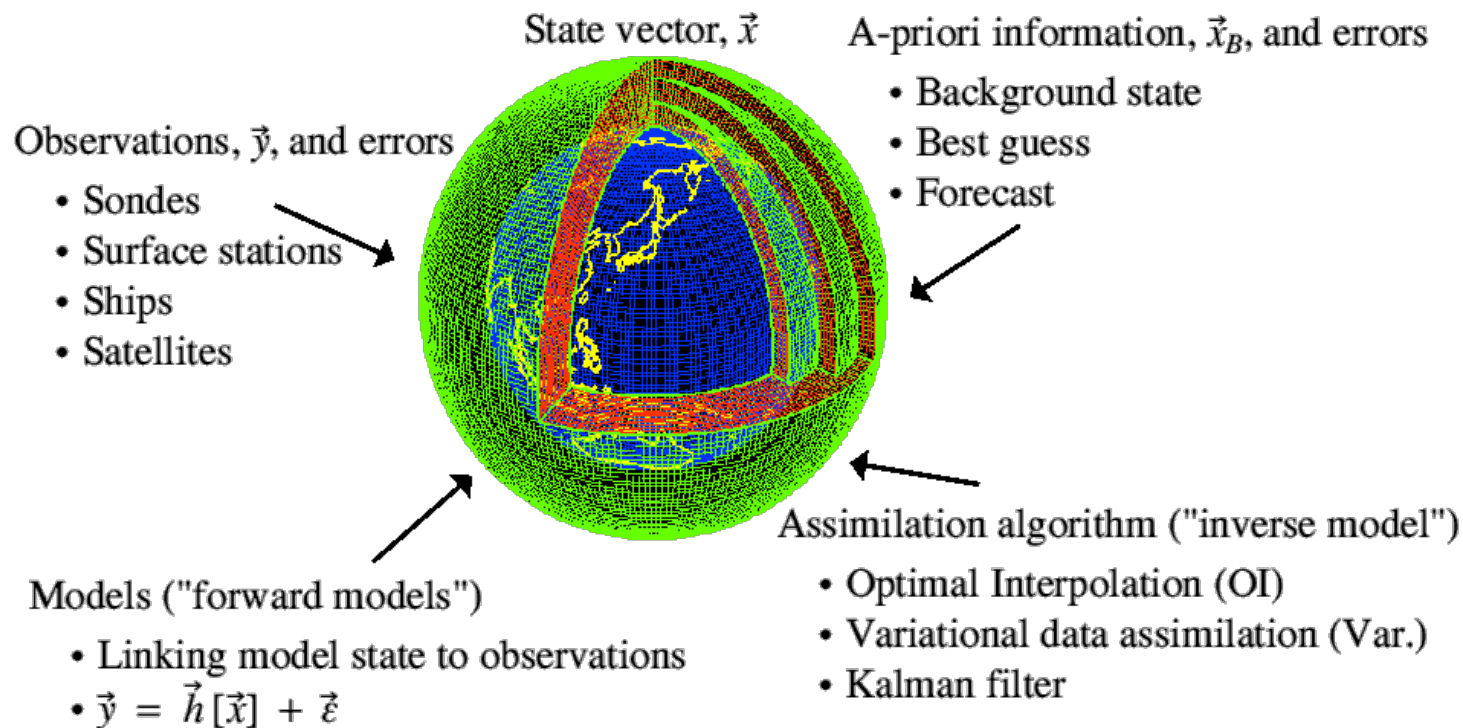
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Numerical weather prediction

$$\text{NWP} = f(\text{observations} + \text{model code} + \text{compute})$$



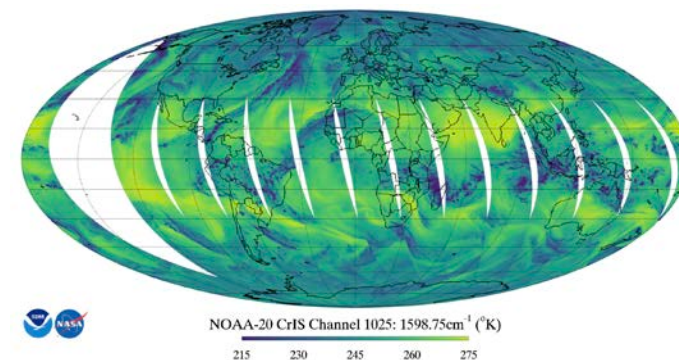
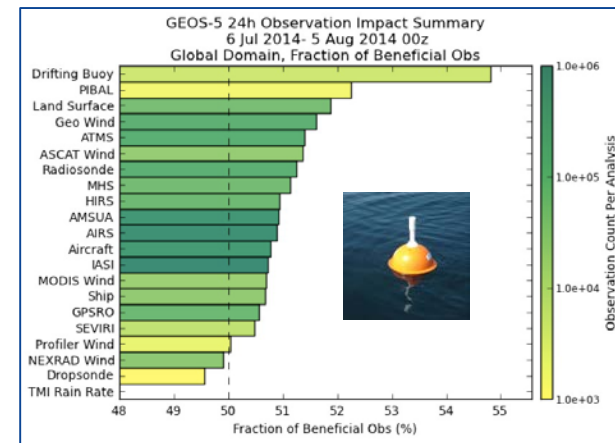
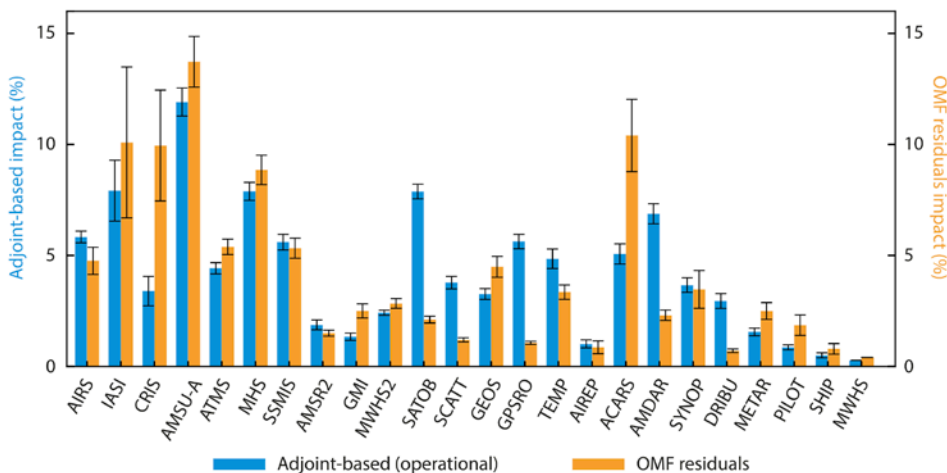


Improving observing systems



Observations are not created equal

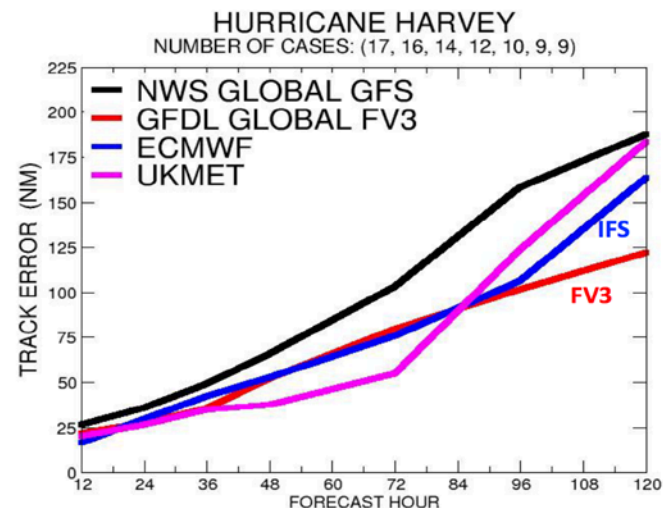
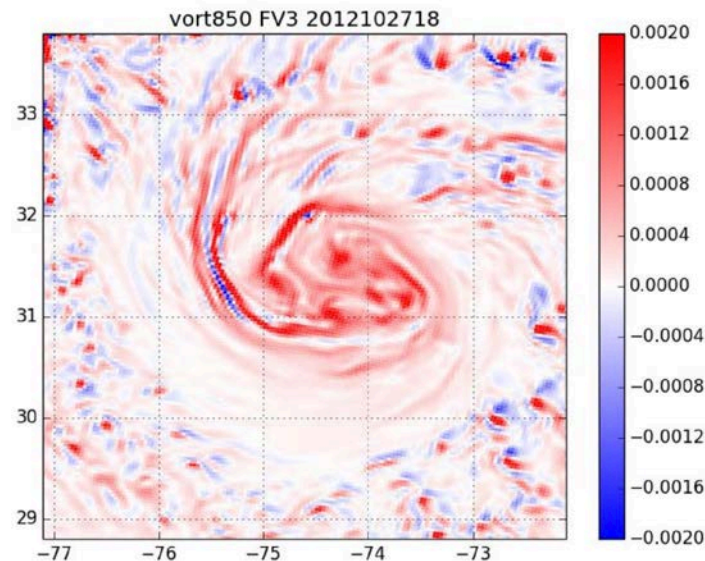
- Observing system experiments
- Forecast sensitivity to observations
- Cost-benefit analysis / value proposition
- Alternative observations / CWDP



Zhou, L.; Divakarla, M.; Liu, X. An Overview of the Joint Polar Satellite System (JPSS) Science Data Product Calibration and Validation. *Remote Sens.* **2016**, *8*, 139.






Improving forecast skill and performance

- Quality control of observations
- Data assimilation
- Dynamic core and model physics
- NGGPS SIP for a Unified Forecasting System
- Code efficiency
- Optimized hardware










Inherent barriers with the status quo

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- Fractured strategy (getting much better!)
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- Obtuse HPC procurement process
 - Security clearance procedures for visiting scientists
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- Cultural (internal and external)
 - Funding allocation process disincentivizes collaboration
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- Risk aversion (incentive not to fail > incentive to improve)
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- Too many committees with overlapping and conflicting input

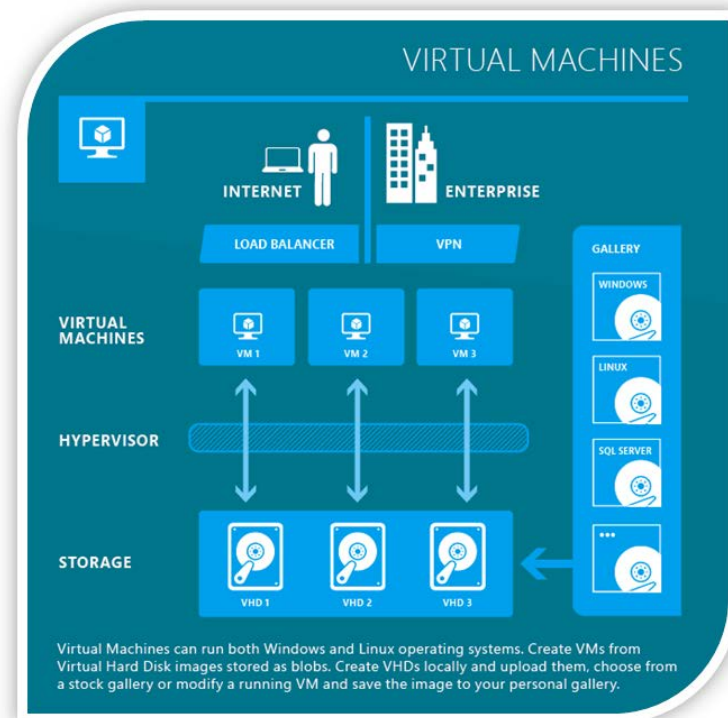


Ideas to accelerate research-to-operations

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- Virtual machines (cloud HPC) for on-demand parallel development
 - End-to-end community model (harness collective advancements)
 - Visiting scientists (UCP/PrepIFS)
 - Modifying the R2O funnel (requirements, gates and transitions)
 - Fast-tracking satellite DA
 - Drive up benefit in cost-benefit ratio
 - Agile/nimble “skunkworks” sandbox
 - Governance / funding

VMs and cloud HPC






- Virtual machines (cloud HPC) for parallel *community* development
- Not all HPC “clouds” are the same
- Consistent with NOAA BDP
- Remote Direct Memory Access (RDMA)
 - Remote memory location read/write
 - No copying
 - Direct processor interface bypasses kernel and TCP/IP in I/O path
- Consistent with NOAA BDP
- Secure ingest (DMZ)





Thank you for serving in this role!

Your feedback and guidance is critical; we are looking to you.

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- What do you think are our biggest challenges?
 - Thoughts on how to solve them?
 - Alternative ideas to our proposed path?
 - Are we overlooking something?
 - Unintended consequences?
 - What do you need from us?
 - How can we better engage SAB?