

# A FLEXIBLE COMPUTATIONAL FRAMEWORK FOR PROJECTING REGIONAL SEA-LEVEL RISE

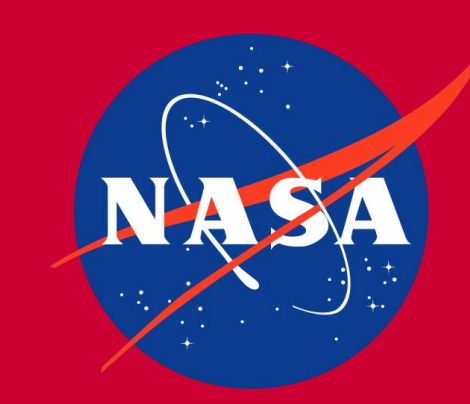
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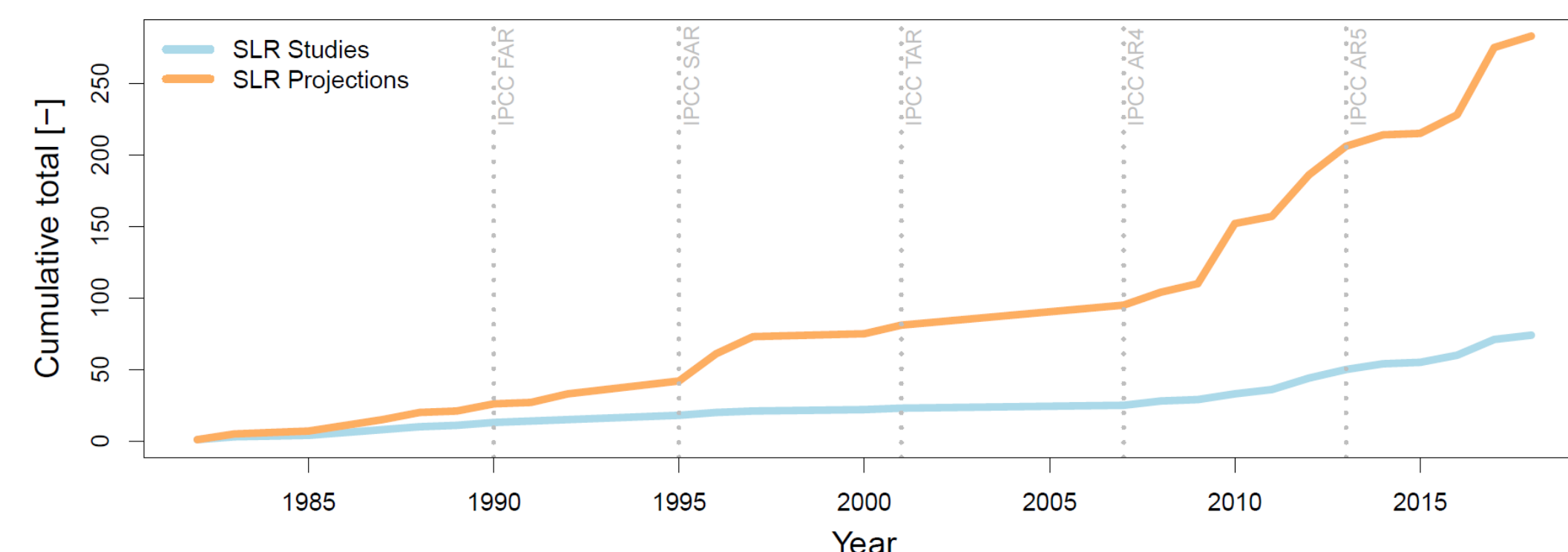


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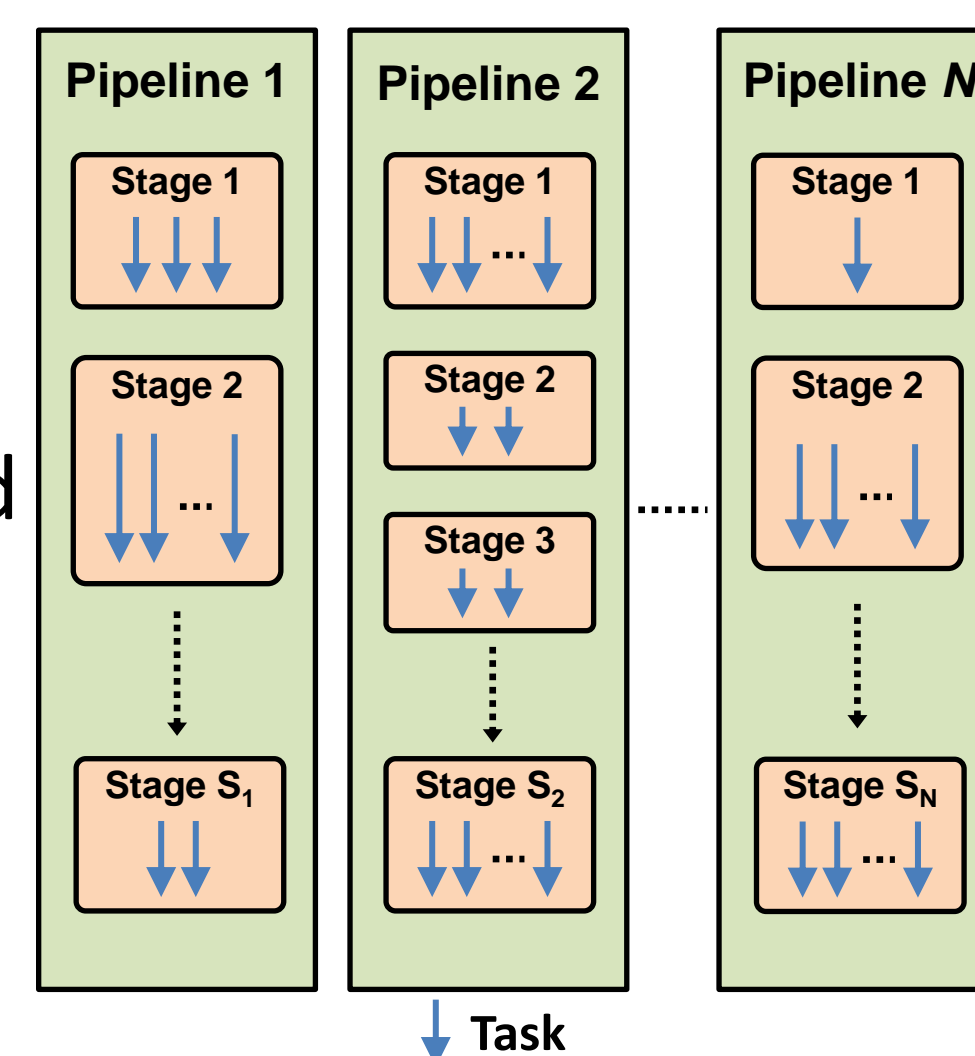
## SEA-LEVEL RISE PROJECTIONS

- Number of studies, projections, and projections per study have been increasing since 1980s.
- Projections incorporate common contributors (i.e. ice melt, ocean dynamics, GIA, etc.).
- Can we facilitate workflows to enhance hypothesis testing, generate large ensembles, and streamline new science into SLR projections?



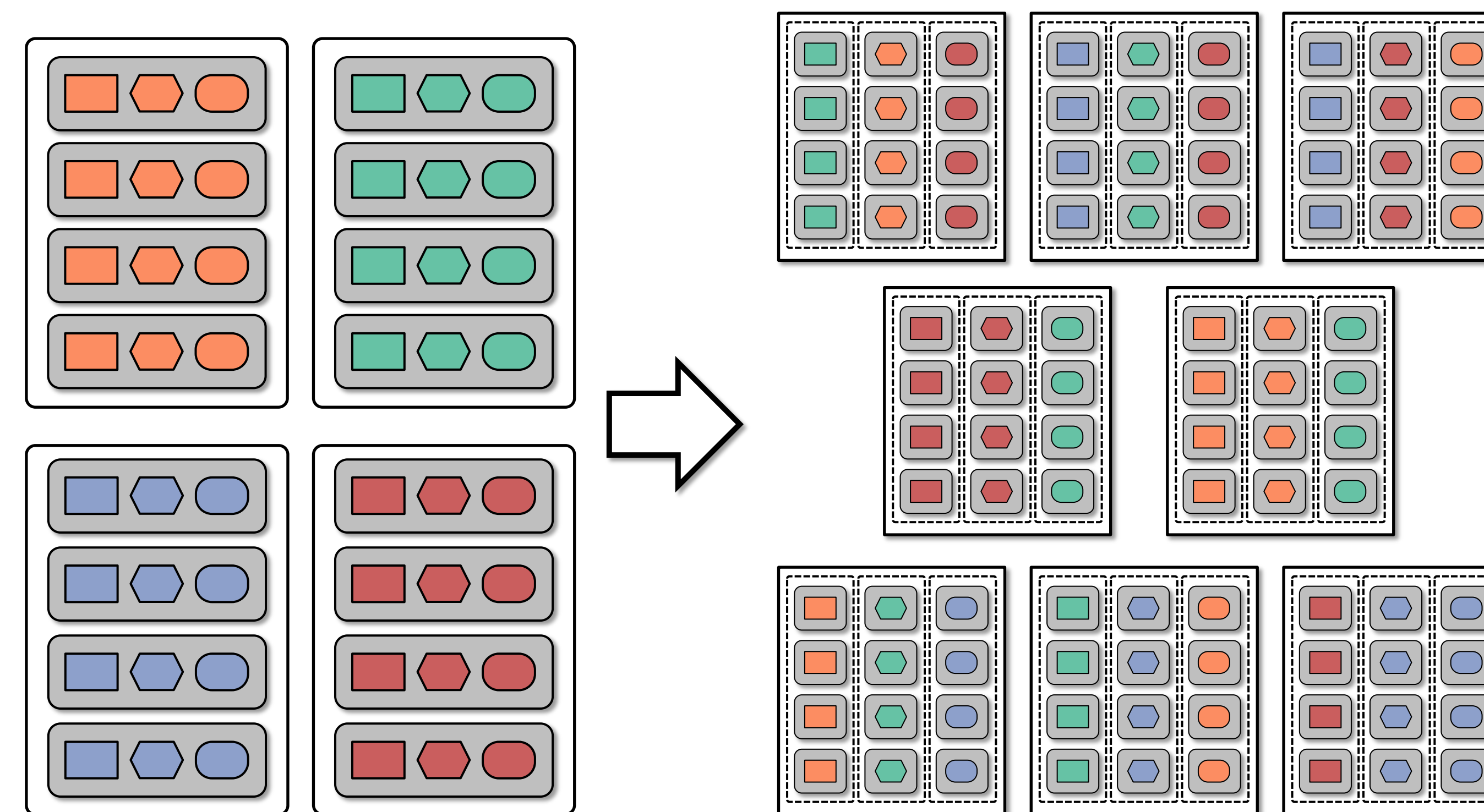
## ENSEMBLE TOOLKIT (EnTK)

- RADICAL group at Rutgers.
- EnTK is a Python library for developing and executing large-scale ensemble-based workflows.
- Pipeline, Stage, Task components outline a workflow model.
- A pipeline is composed of a sequence of stages and each stage contains a series of tasks.
- Tasks and pipelines can be executed in parallel while stages are executed sequentially.
- EnTK can dynamically adapt workflow based on the state of the ensemble.
- Leverages RADICAL Pilot to distribute computing among national supercomputing resources.

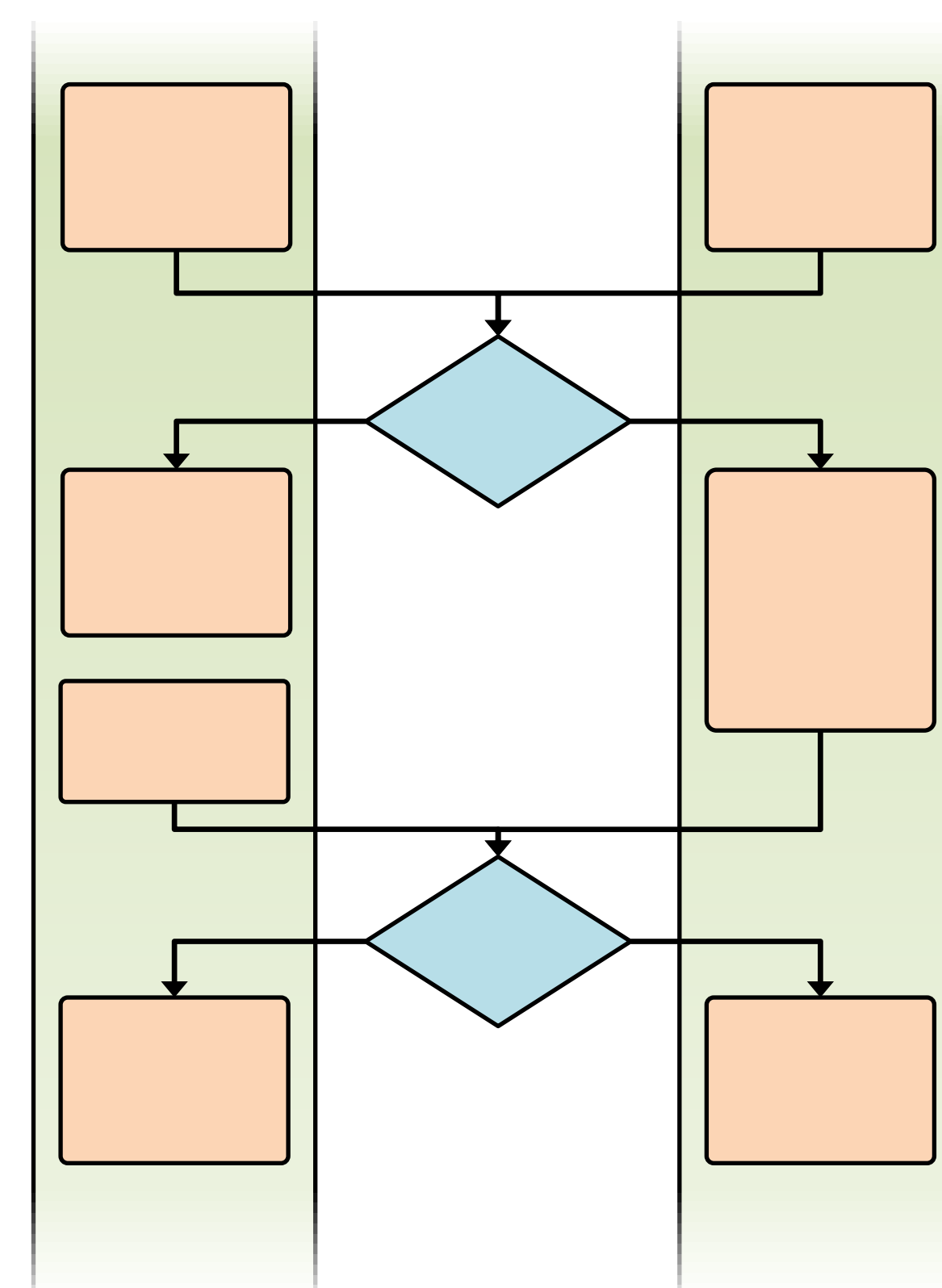


## FRAMEWORK FEATURES

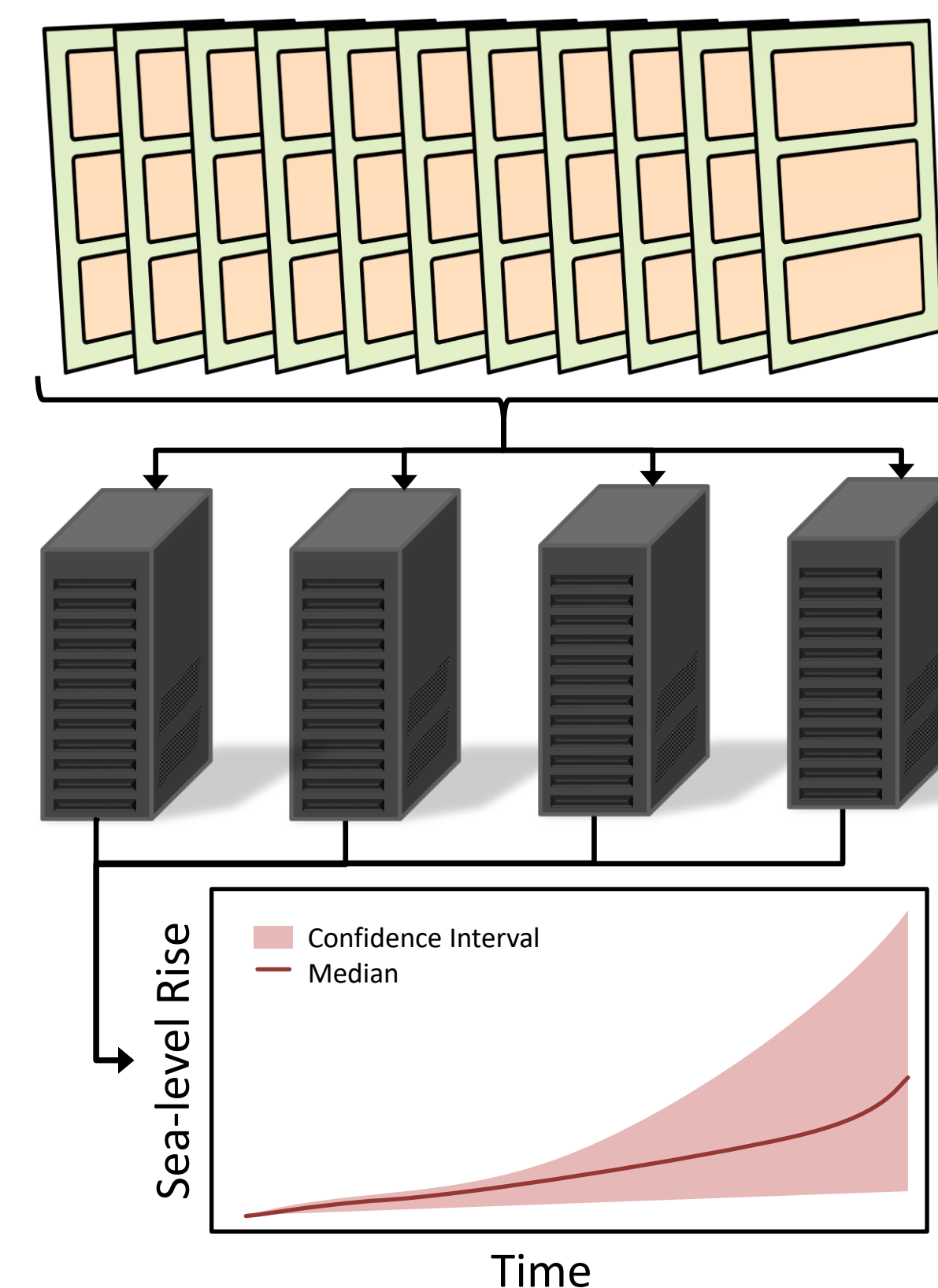
**Modular:** Mix and match workflows



**Cross-communication:**  
Interactions among  
SLR contributors



**HPC Distribution:**  
Efficient use of  
computing resources



## MOVING FORWARD

- Port past studies into workflows for the framework.
- Develop new modules representing advancements in understand of SLR contributors.
- Prepare experiments for new SLR projections in time for the next Intergovernmental Panel on Climate Change Assessment Report (IPCC AR6).
- Explore new science questions enabled by this framework (e.g. value of information).

## REFERENCES

### SLR study and projection data

Garner, A.J., Weiss, J.L., Parris, A., Kopp, R.E., Horton, R.M., Overpeck, J.T., Horton, B.P. (2018). Evolution of 21<sup>st</sup> Century Sea Level Rise Projections. *Earth's Future*, 6 (11), 1603-1615. DOI: 10.1029/2018EF000991

### Ensemble Toolkit

Balasubramanian, V., Treikalis, A., Weidner, O., Jha, S. (2016). Ensemble toolkit: Scalable and flexible execution of ensembles of tasks. In *Parallel Processing (ICPP)*, 2016 45th International Conference, IEEE, 458-463. DOI: 10.1109/ICPP.2016.59

<https://github.com/radical-cybertools/radical.entk>

<https://radicalentk.readthedocs.io/en/latest/>

## ACKNOWLEDGEMENTS

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