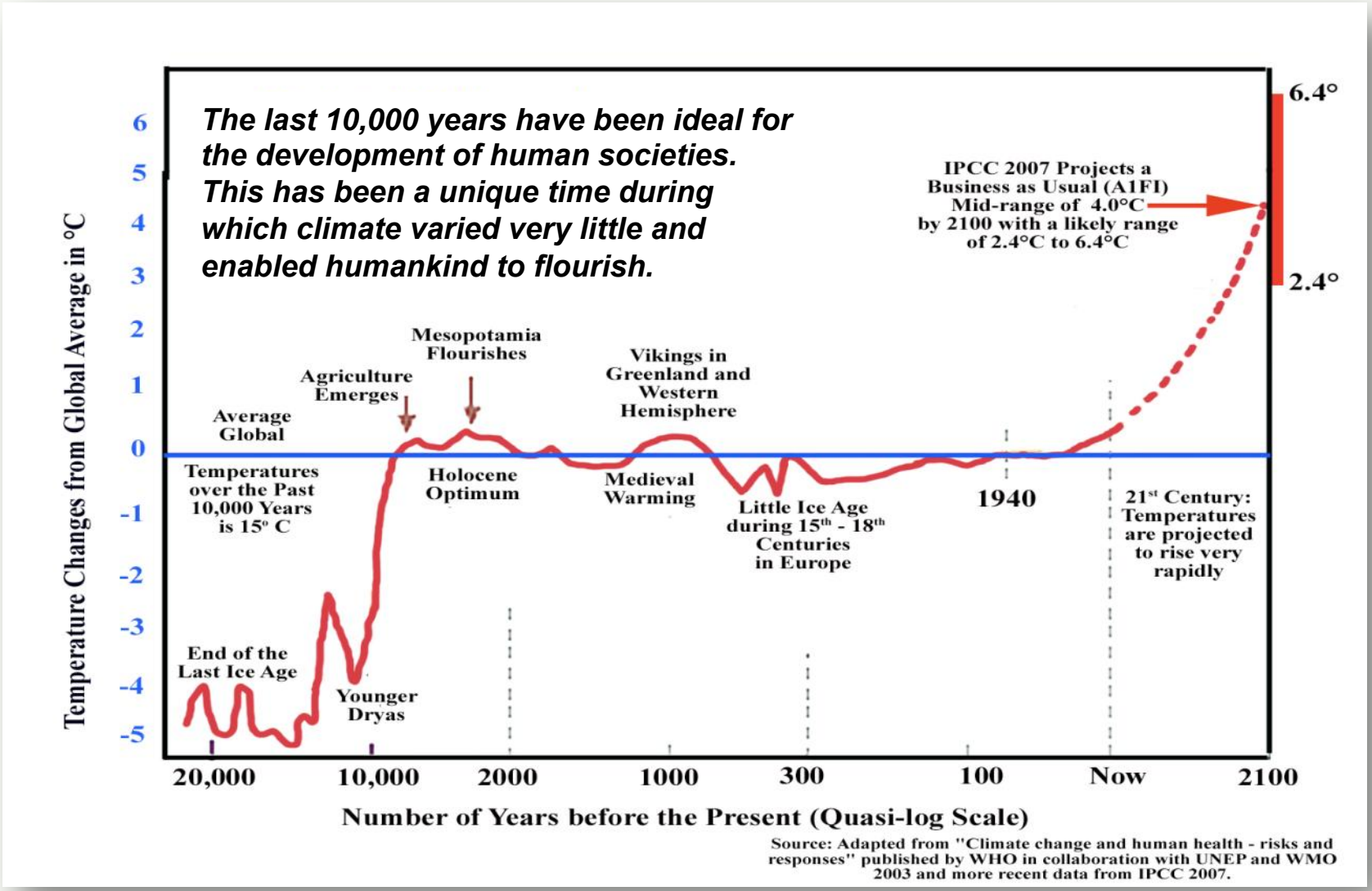
Water into Wine: Condor, PEST, and Hydrologic Modeling

Mike Fienen and Randy Hunt
Research Hydrologists
USGS Wisconsin Water Science Center

USGS science for a changing world

CIDA Center for Integrated Data Analytics

Sea Level Rise



USGS science for a changing world

CIDA Center for Integrated Data Analytics

Piping Plover—vulnerable to Sea Level Rise

Have we always lived in this neighborhood?

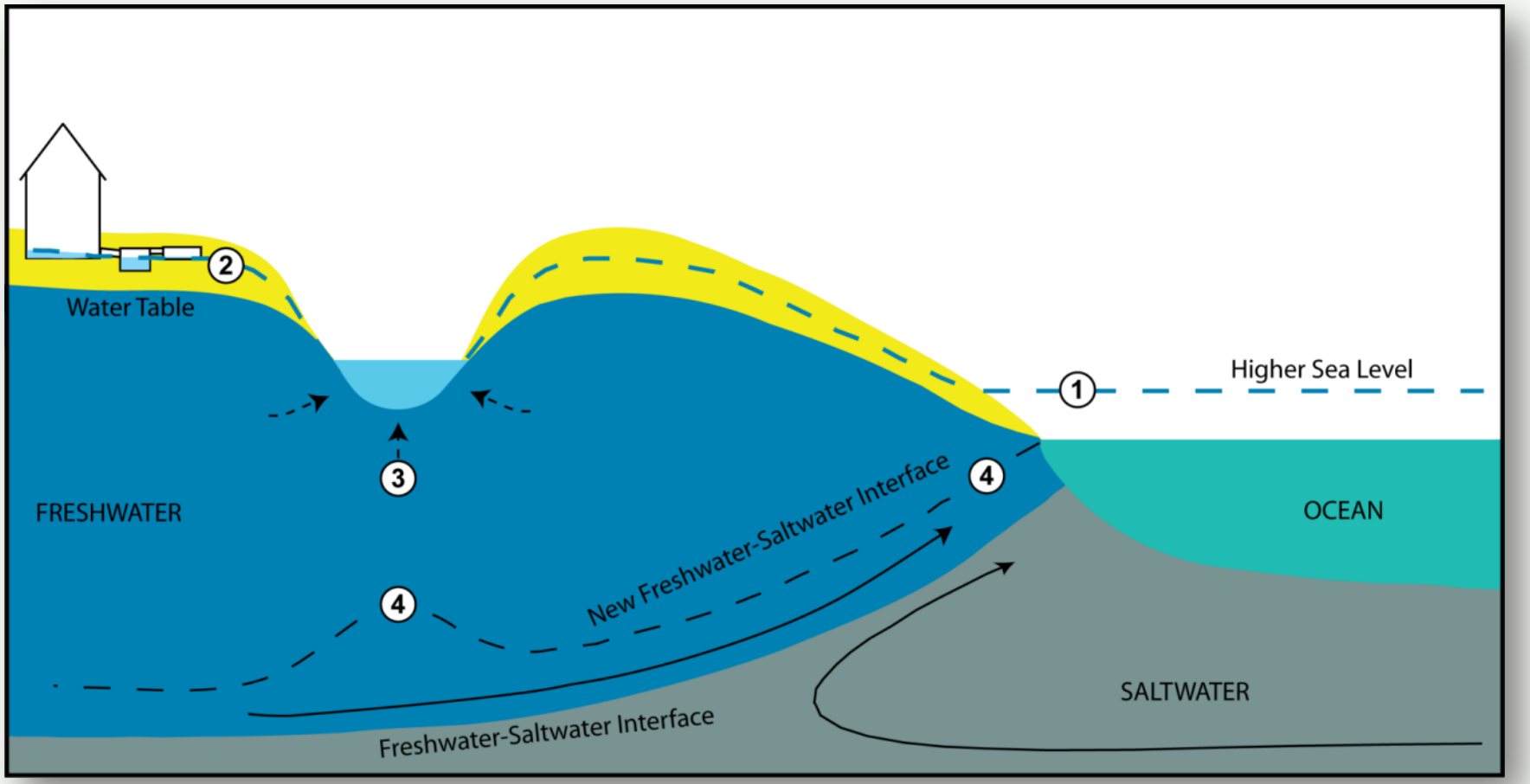
Among the impacts on Plover habitat is depth to groundwater.

Small islands off the Atlantic Coast like Assateague Island, are a great early-warning system.

1998 2006

USGS
science for a changing world

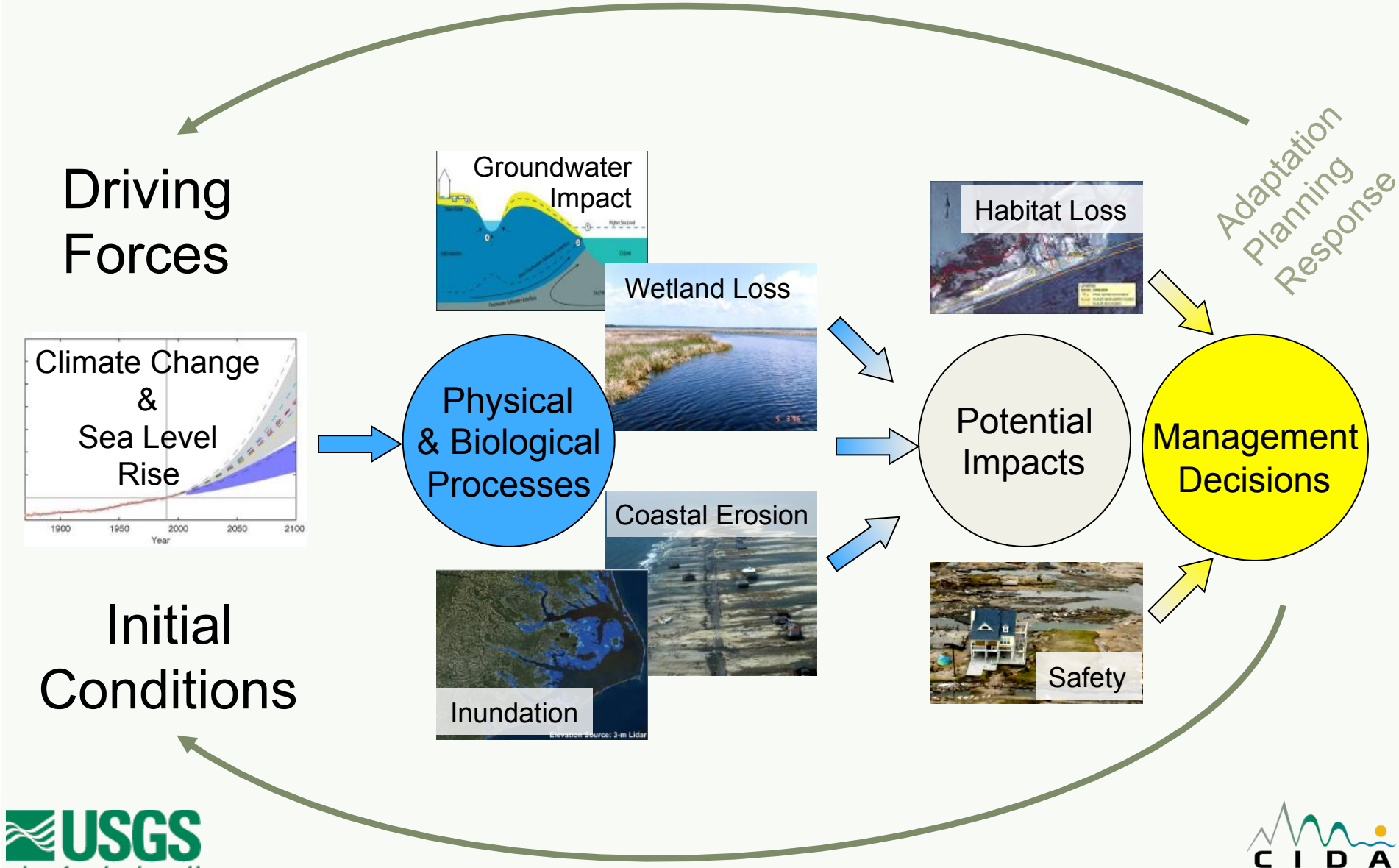
Groundwater Impacts—Important for Plovers and People



USGS science for a changing world

CIDA Center for Integrated Data Analytics

Sea-level rise impacts:
A multivariate problem full of uncertainties



USGS science for a changing world

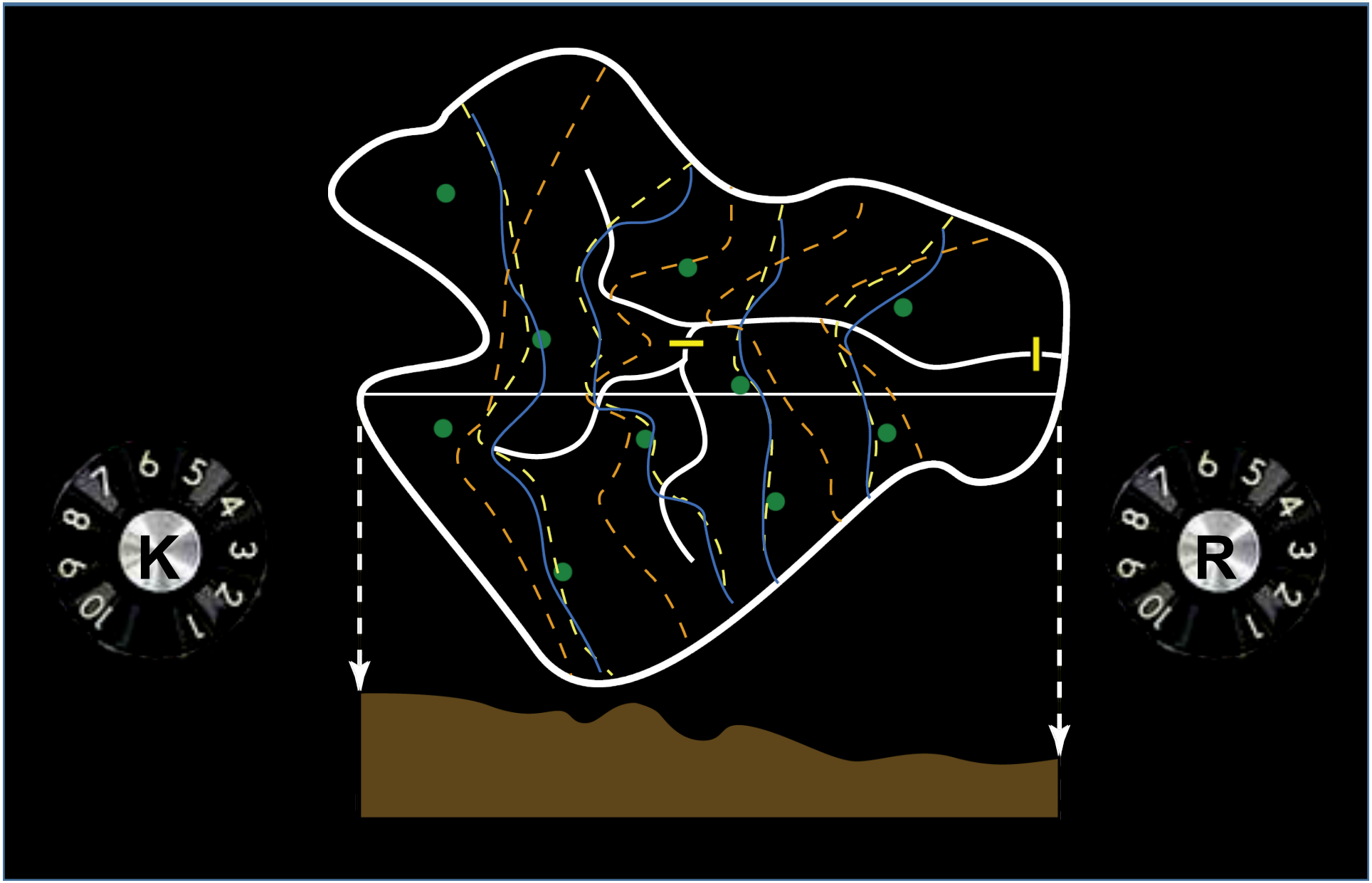
CIDA Center for Integrated Data Analytics

Assateague Island Groundwater Model

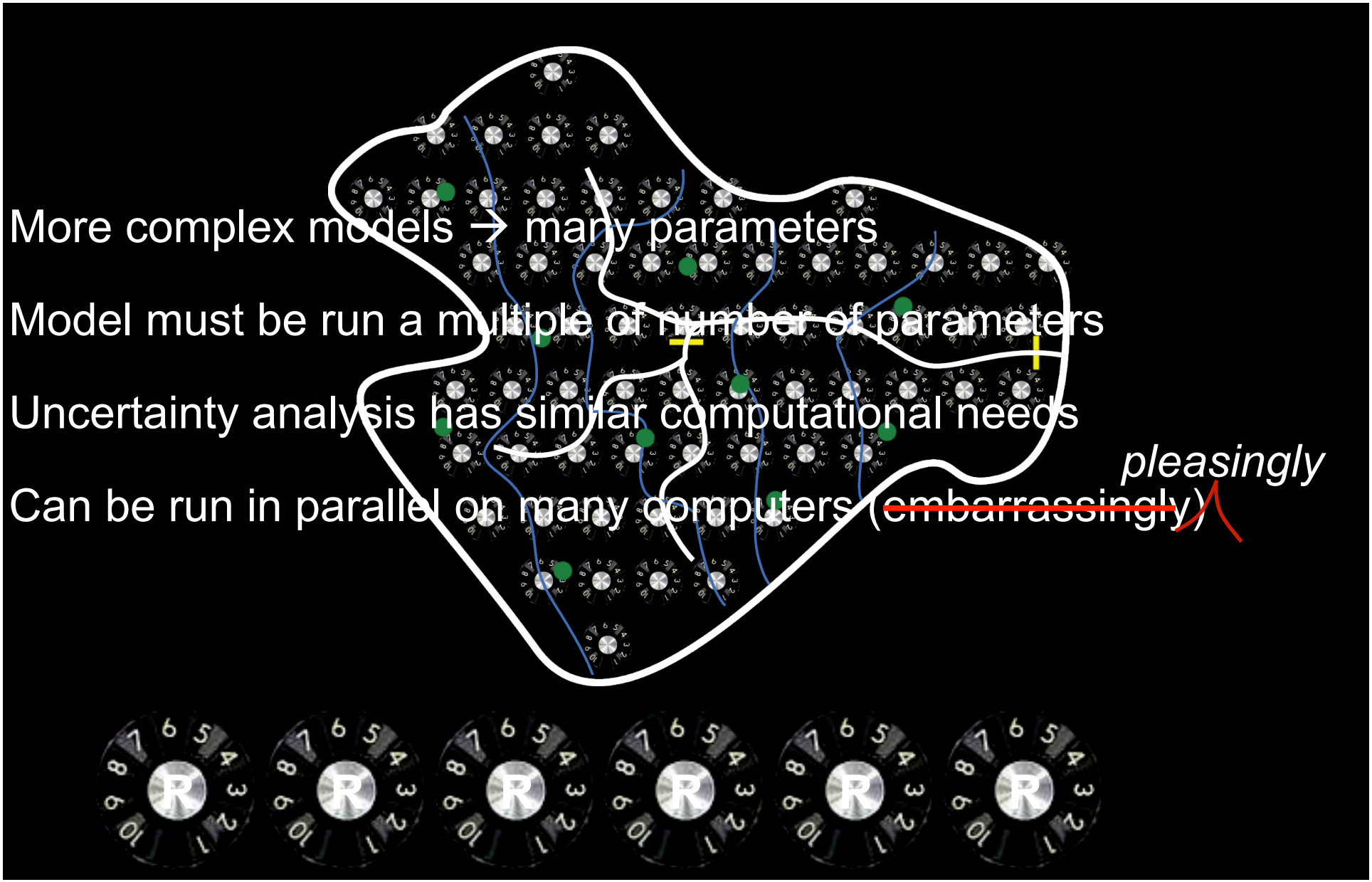
USGS science for a changing world

CIDA Center for Integrated Data Analytics

Groundwater Model Calibration



Calibration and Uncertainty



What is PEST?

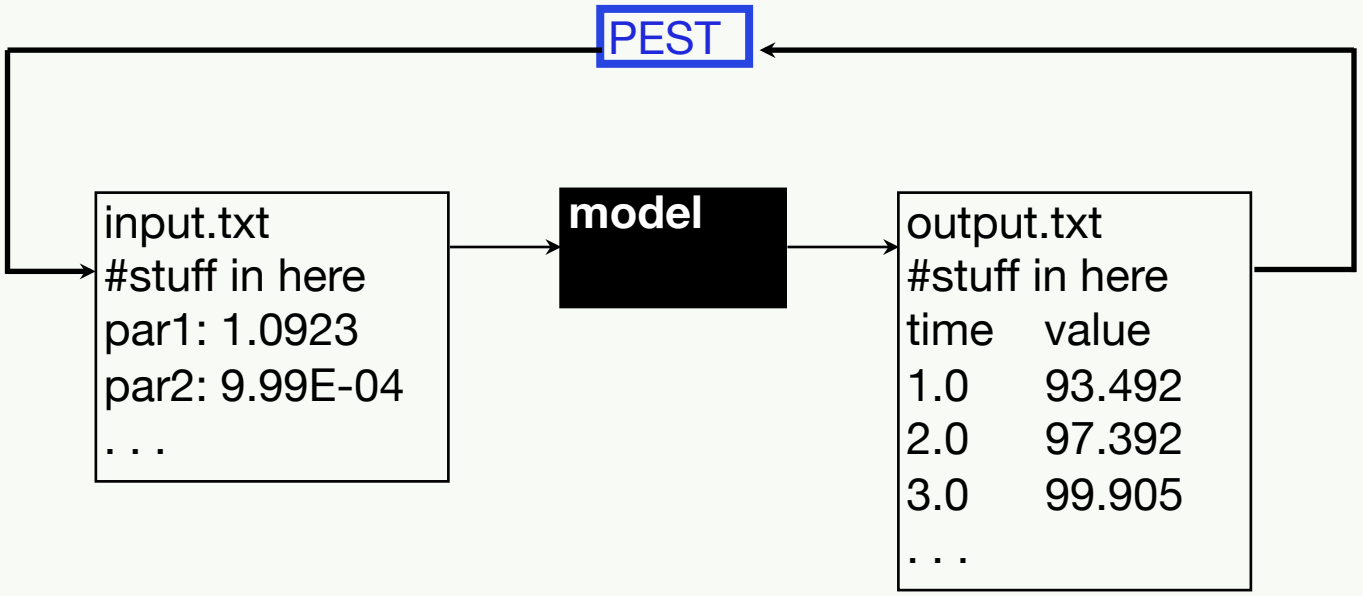
Written by John Doherty/Watermark Numerical Computing

Model-independent parameter estimation code

Writes ASCII model input, **reads** ASCII model output

Takes control of a model and runs it many, many times

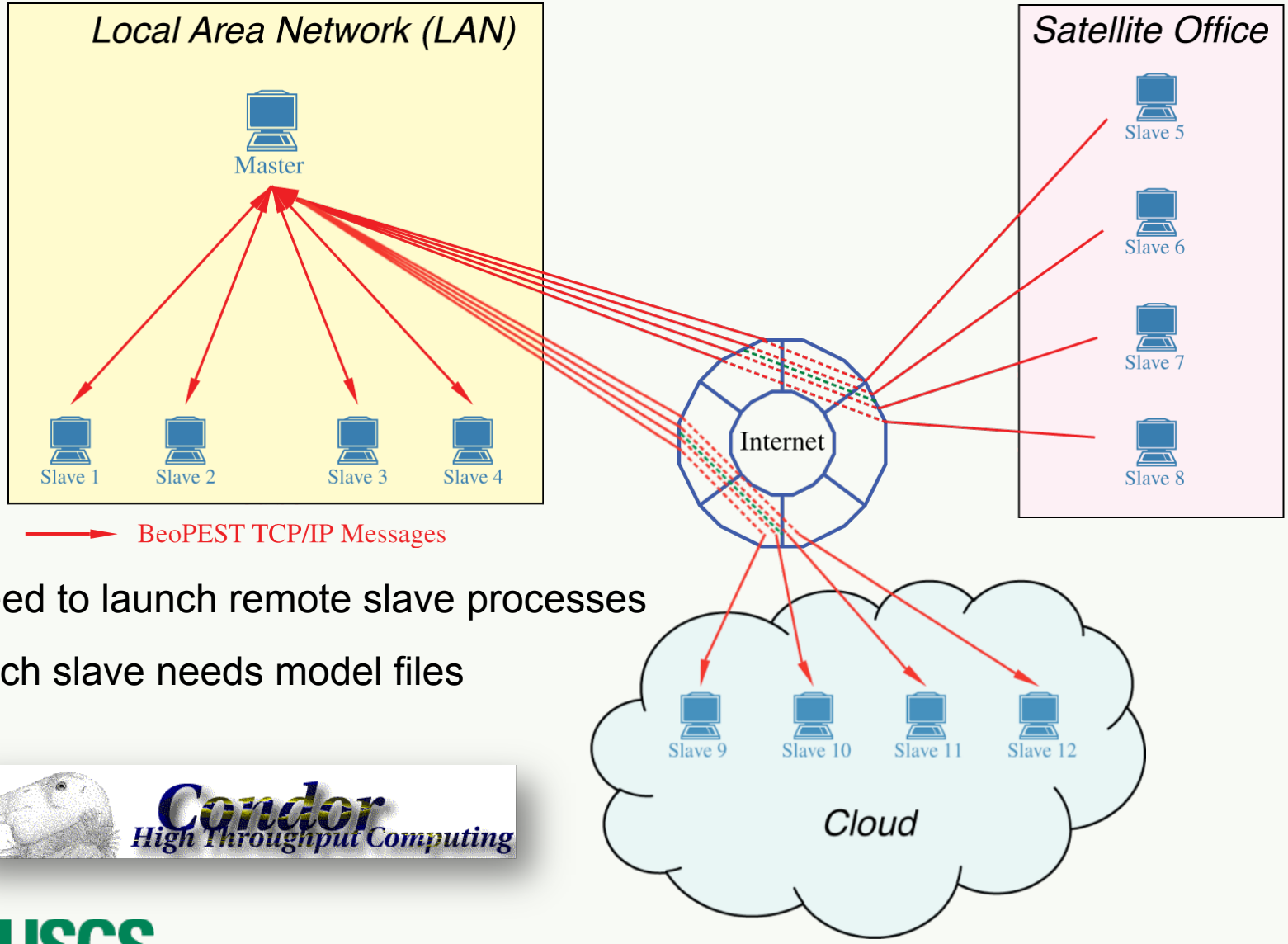
Pleasingly parallel



USGS science for a changing world

CIDA Center for Integrated Data Analytics

beoPEST is an ideal tool for model calibration



Need to launch remote slave processes

Each slave needs model files

Condor
High Throughput Computing

USGS
science for a changing world

CIDA
Center for Integrated Data Analytics

Condor with beoPEST

Condor Advantages:

Move data to each worker machine

Automate starting of worker [illegible]es

Provide monitoring

Allow us to accomm[illegible]ux and Windows user base

Started out with abou[illegible] Linux [illegible]nd 450 Windows cores

Windows Issues:

Very expensive to access
more than 32GB RAM/blade

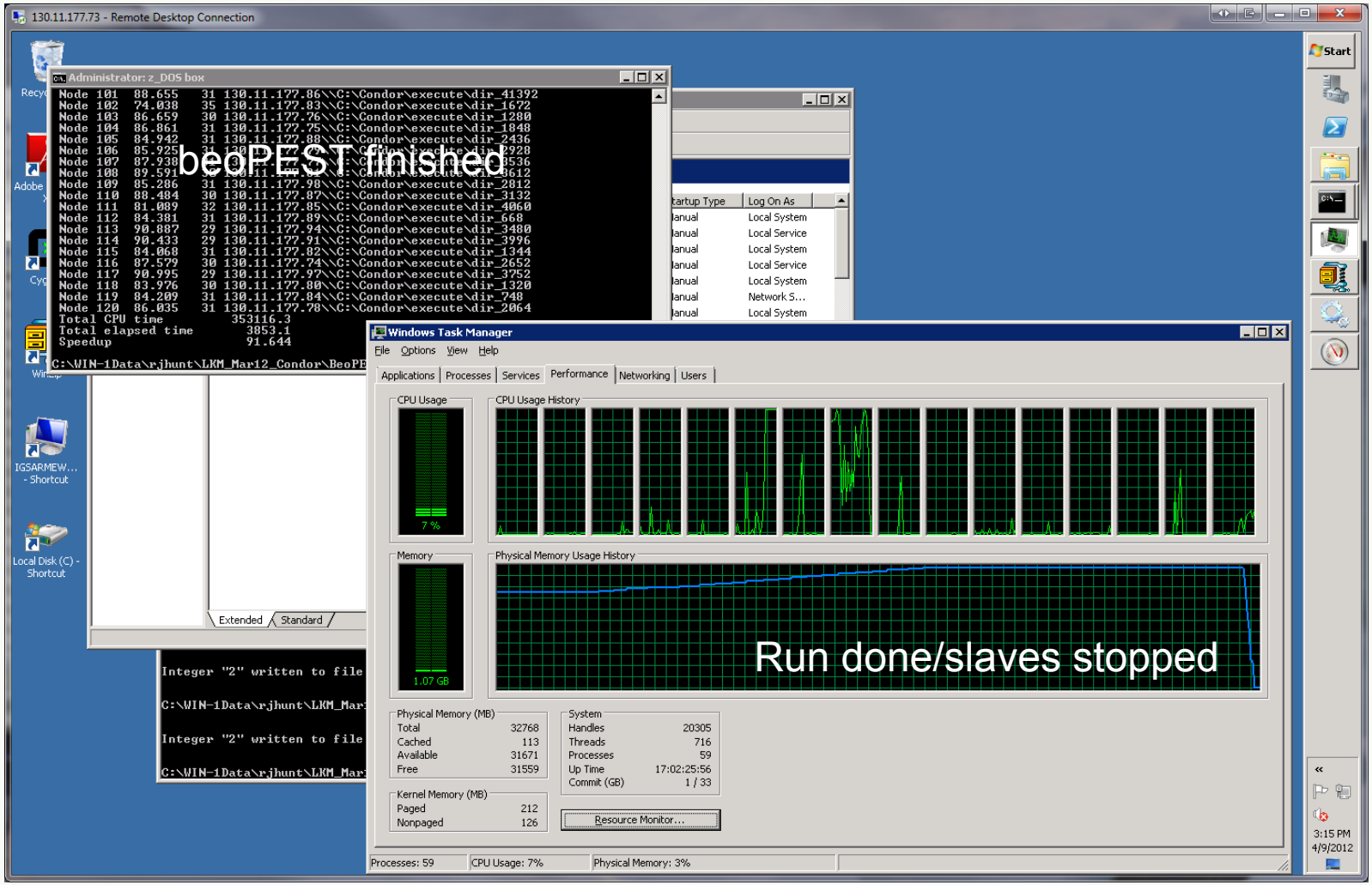
TCP/IP related memory trouble

Our parent agency proposed
$600/year/machine Windows license surcharge.

USGS science for a changing world

CIDA Center for Integrated Data Analytics

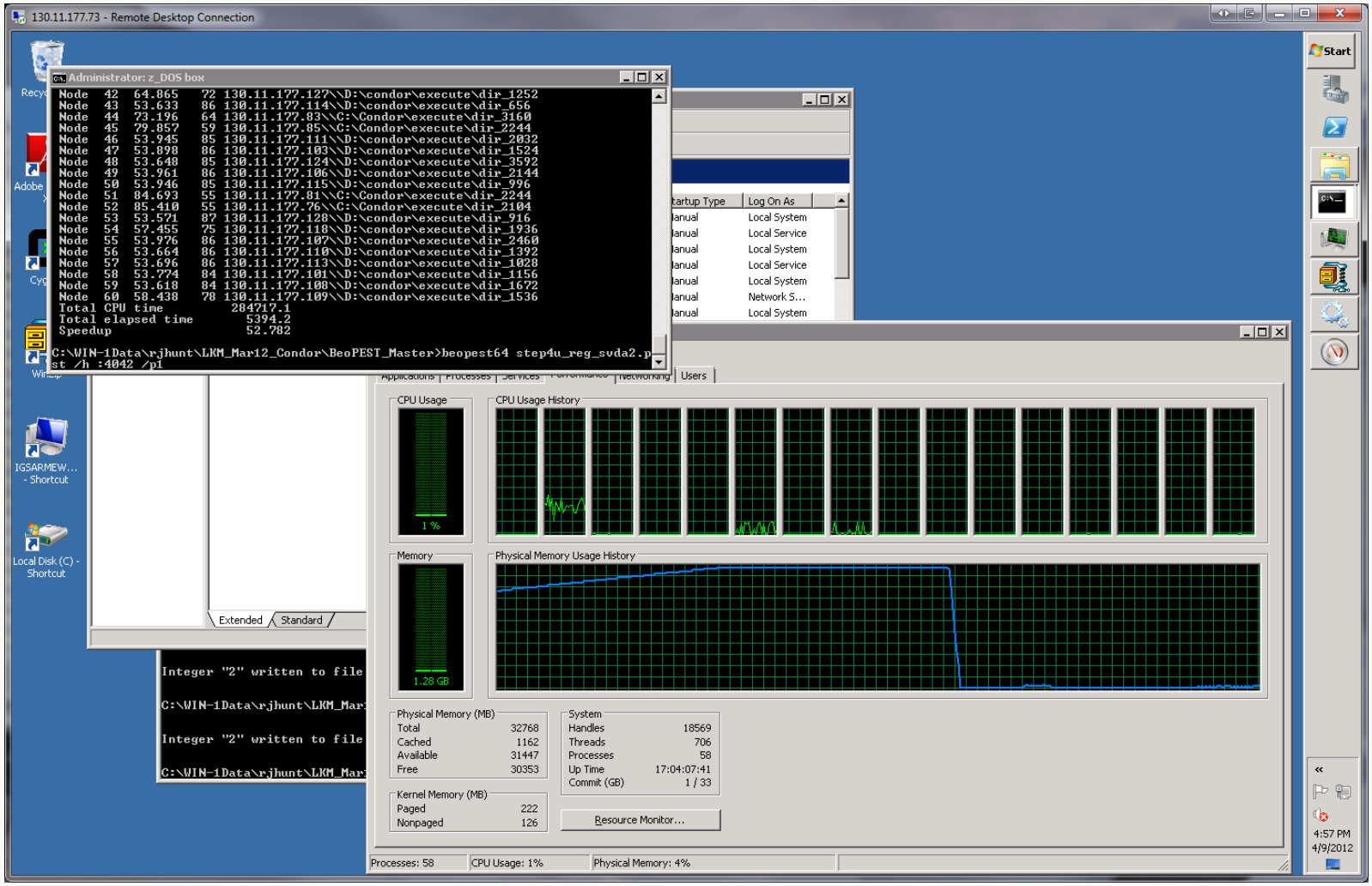
winsock.dll Sings the Blues—120 Workers



USGS science for a changing world

CIDA Center for Integrated Data Analytics

winsock.dll Sings the Blues—60 Workers



USGS science for a changing world

CIDA Center for Integrated Data Analytics


Deflectrshld
<Away>Zenariah the Light of Dawn
<Stormgarde Militia>
Edaline
<Dawn Tippers>
156k
Deflectrshld
Antitoxin
<Midnight Mafia>
s: You disgust me.
Away.

Making Wine Fine

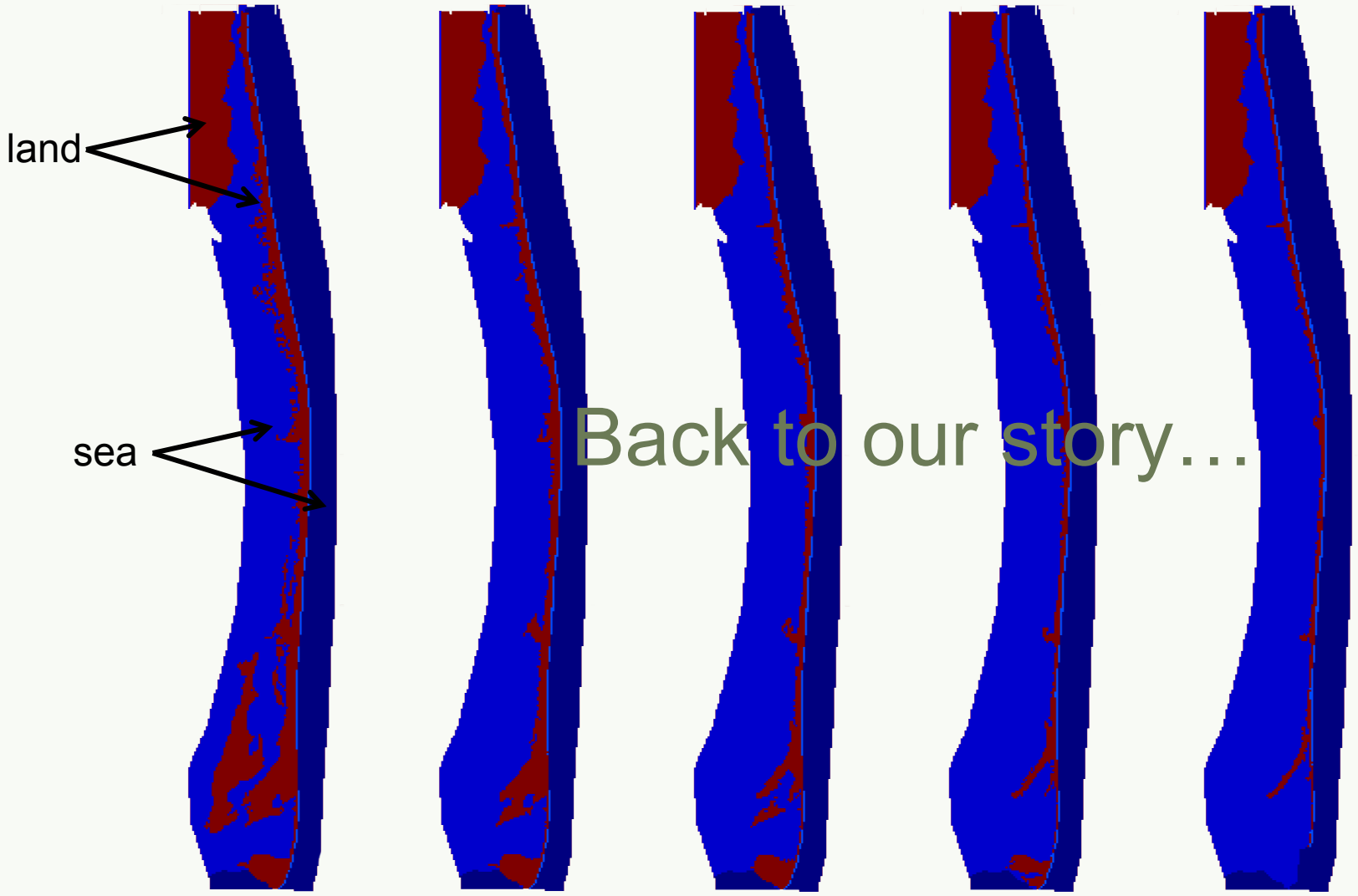
```
WINEPREFIX=$_CONDOR_SCRATCH_DIR
```

Thanks Ian Chesal and
Rich Pieri via [condor-users]!!!

USGS science for a changing world

CIDA Center for Integrated Data Analytics

Sea Level Rise Impacts on Island Geometry—DRAFT

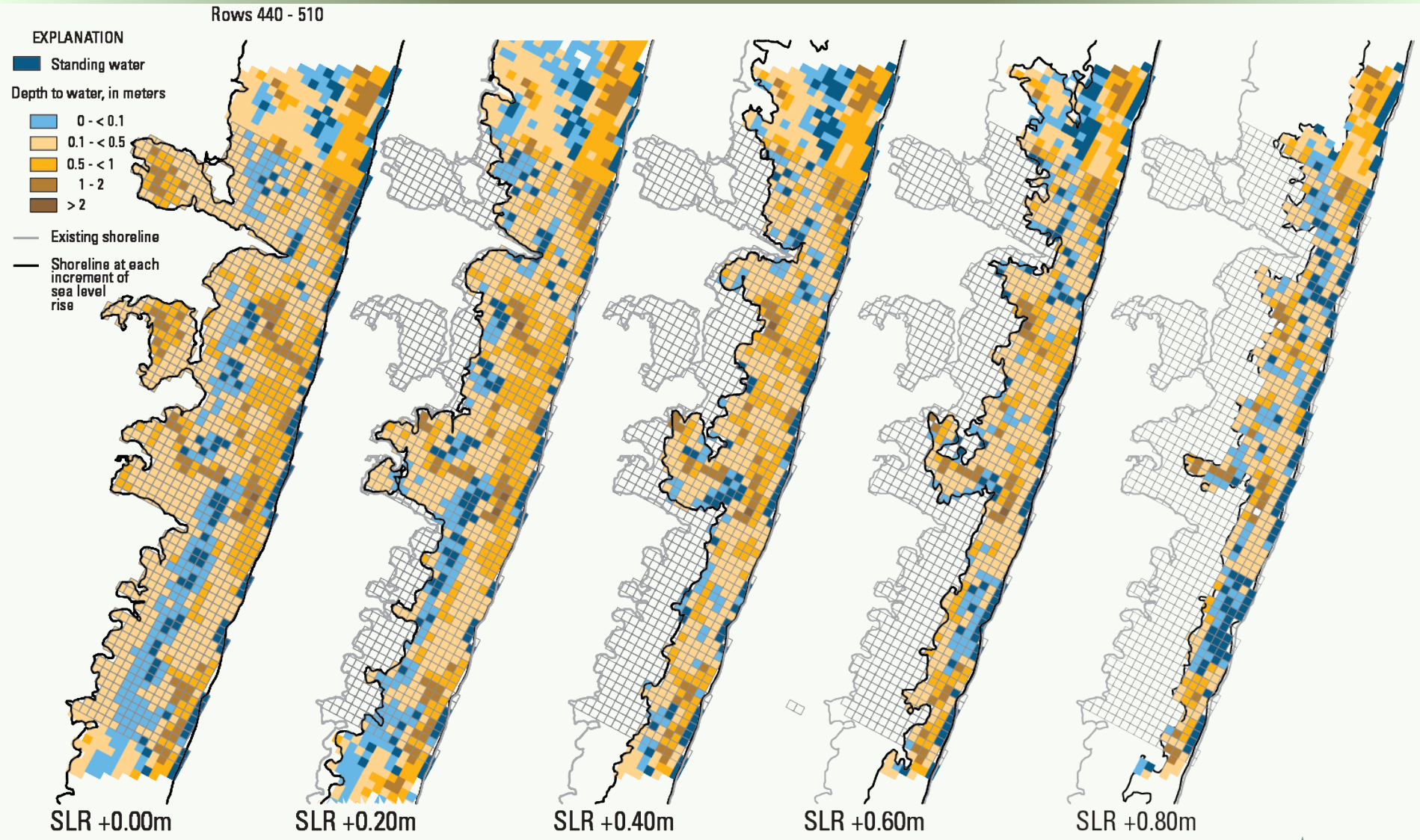


Back to our story…

USGS science for a changing world

CIDA Center for Integrated Data Analytics

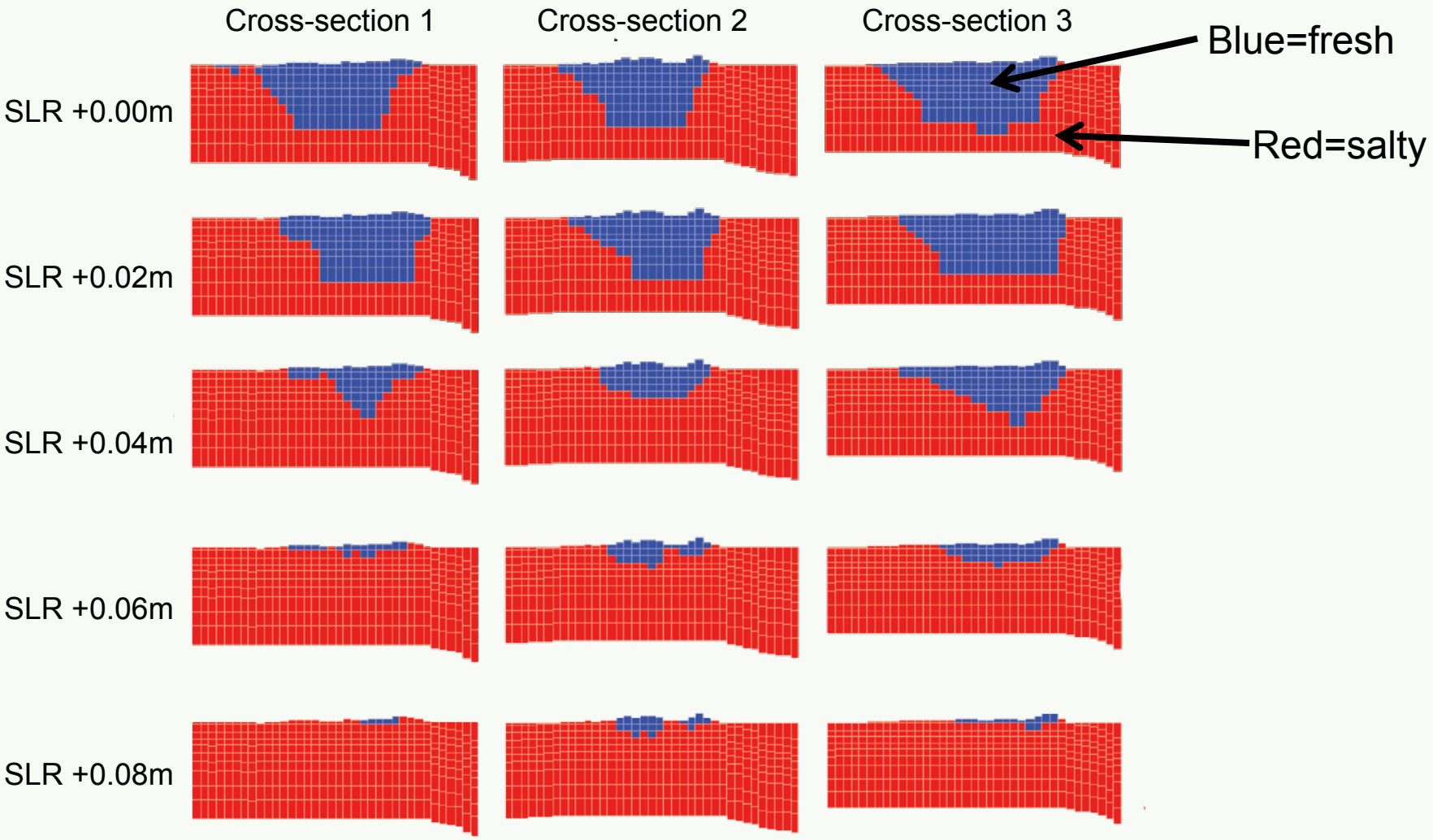
Groundwater Results of Sea Level Rise Simulations—DRAFT



USGS science for a changing world

CIDA Center for Integrated Data Analytics

Salinity Results of Sea Level Rise Simulations—DRAFT



USGS science for a changing world

CIDA Center for Integrated Data Analytics

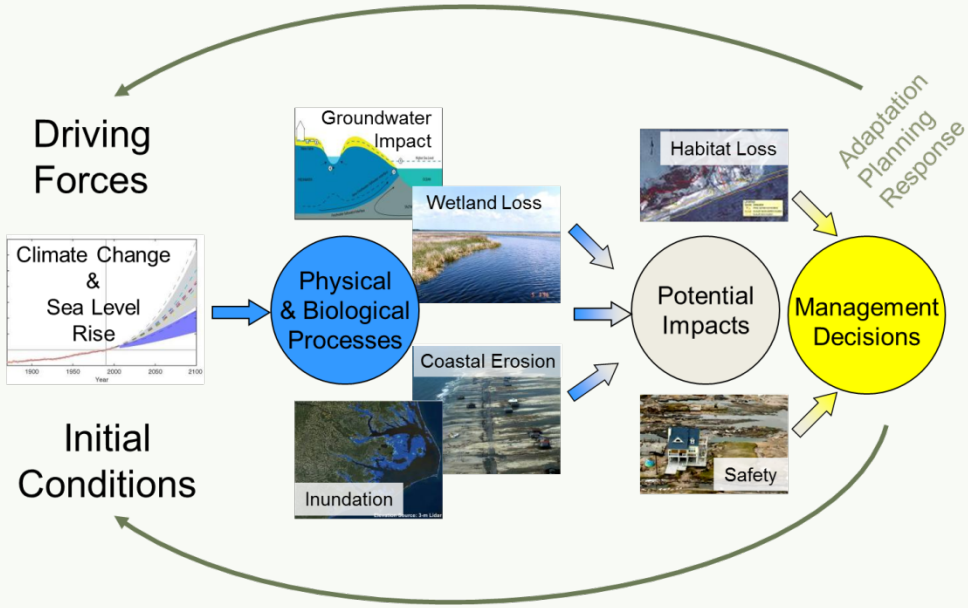
What's next?

Continue refining how beoPEST and Condor interact.

More hardware.

Incorporate GW results into a Bayesian Decision Network along with other processes.

Start linking the process models explicitly which will require much more computational power and more adventures with Condor.



USGS science for a changing world

CIDA Center for Integrated Data Analytics

Thanks to:
John Doherty: Watermark Numerical Computing, Flinders University (Australia)
Willem Schreüder: Principia Mathematica
Miron Livny, Brooklin Gore, Todd Tannenbaum, Vladimir Brik, Cathrin Weiss: CHTC
Harry House, Daniel Kester, Ben Feinstein, Shirley Stephan: USGS—CIDA
Ryan Heath, John Masterson, Rob Thieler, Nathaniel Plant: USGS

USGS science for a changing world

Condor High Throughput Computing

CIDA Center for Integrated Data Analytics