Salinity Emulator Dashboard

Workshop on Delta Flow-Salinity Modeling Using Machine Learning
January 27, 2023
Module #2

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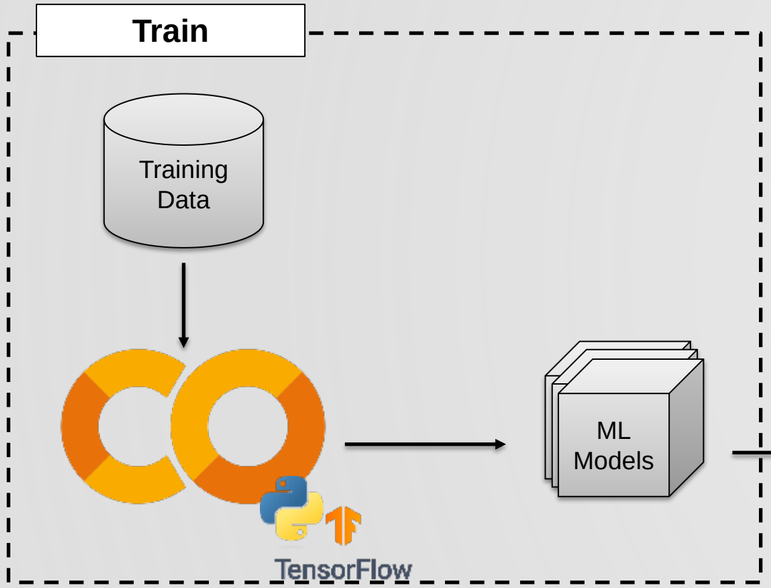
Dashboard Introduction

- A complementary browser-based Delta Salinity Dashboard was developed to serve as the **front-end user interface for the DSM2 salinity emulation machine learning models**.

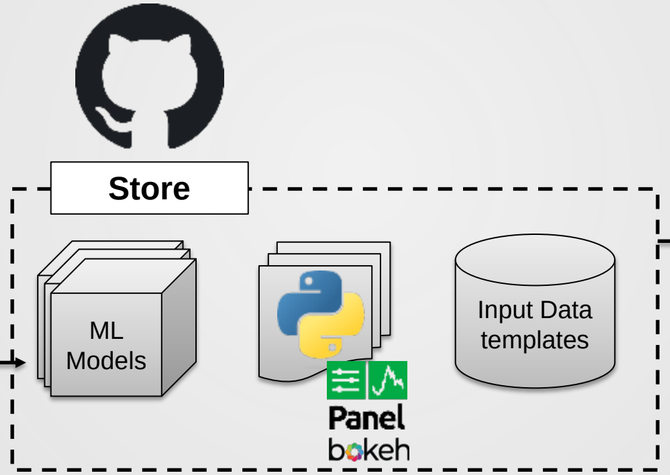
- Users can **interactively explore hypothetical scenarios** (e.g., by varying Delta boundary conditions including inflows, export levels, boundary salinity, etc.) and view the corresponding salinity outputs at key compliance locations during user-defined simulation periods.

Dashboard Architecture

Models are trained on **Google Colab** using the scripts reviewed today (they can also be trained locally).



Models, template input data, evaluation dashboard scripts are stored in a **GitHub** repository.



Pre-trained emulator models are hosted on **Microsoft Azure**, and *evaluation* of the models are computed on their servers.

Servers can be scaled up or out to accommodate higher machine workloads (for more complex models) or larger user volumes.

DSM2 Emulator Dashboard

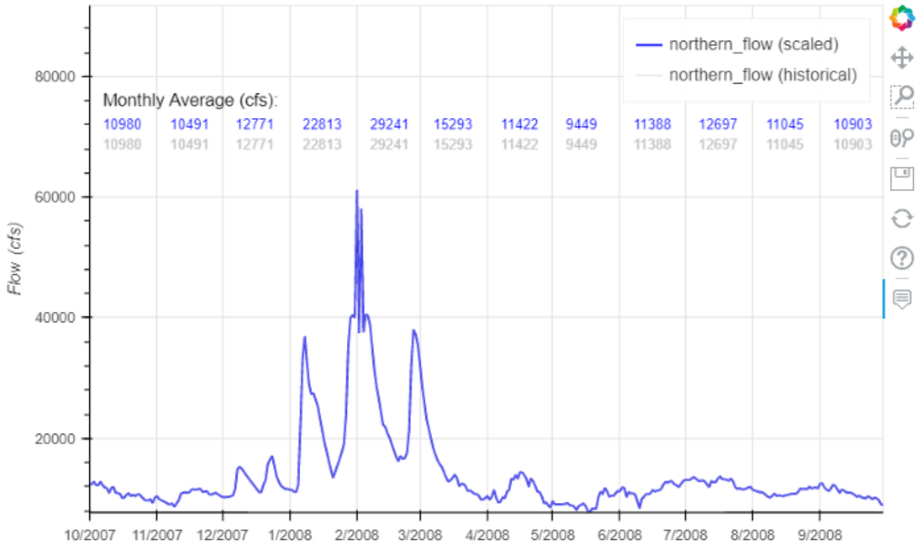
Simulation Period (WY)

1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 **2008** 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

ANN Inputs - Input Scaler

Northern Flow | Exports | SJR flow | SJR Vernalis EC | Sac Greens EC

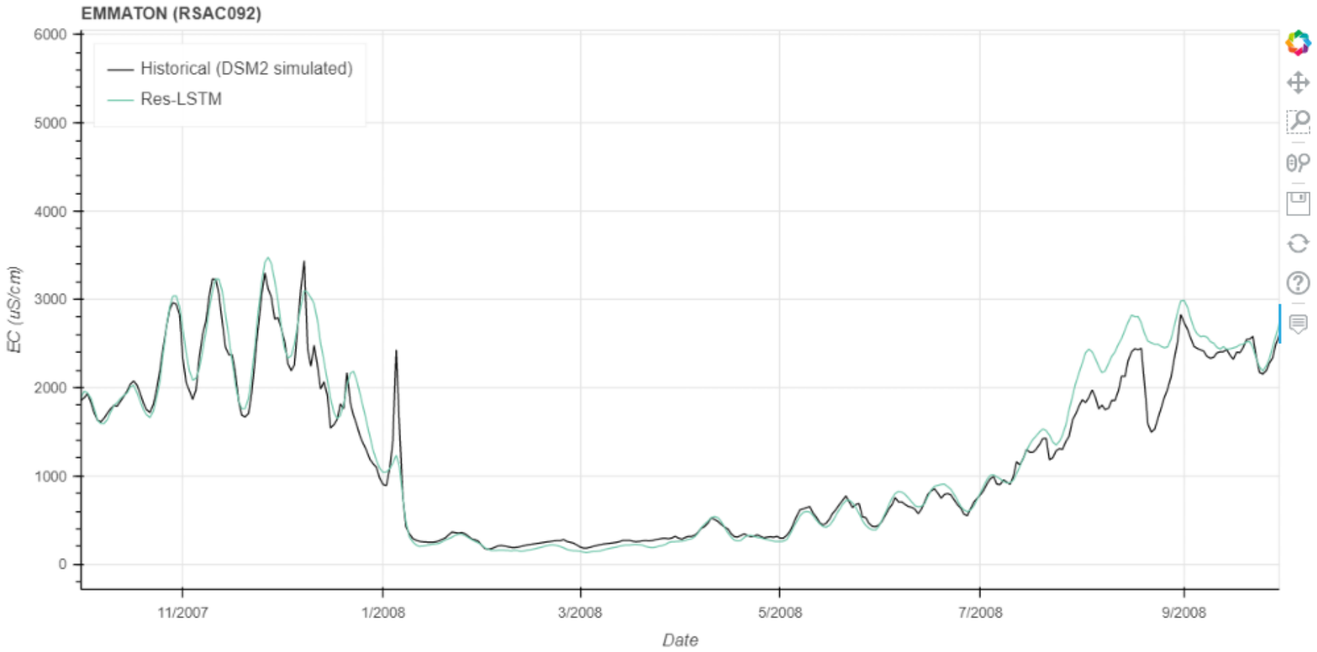
Oct: 1 Nov: 1 Dec: 1 Jan: 1 Feb: 1 Mar: 1 Apr: 1 May: 1 Jun: 1 Jul: 1 Aug: 1 Sep: 1



ANN Outputs

Plots | Tabulated Outputs

Output Location: EMMATON



☑ Res-LSTM ☐ Res-GRU ☐ LSTM ☐ GRU ☐ ResNet

Refresh Plot

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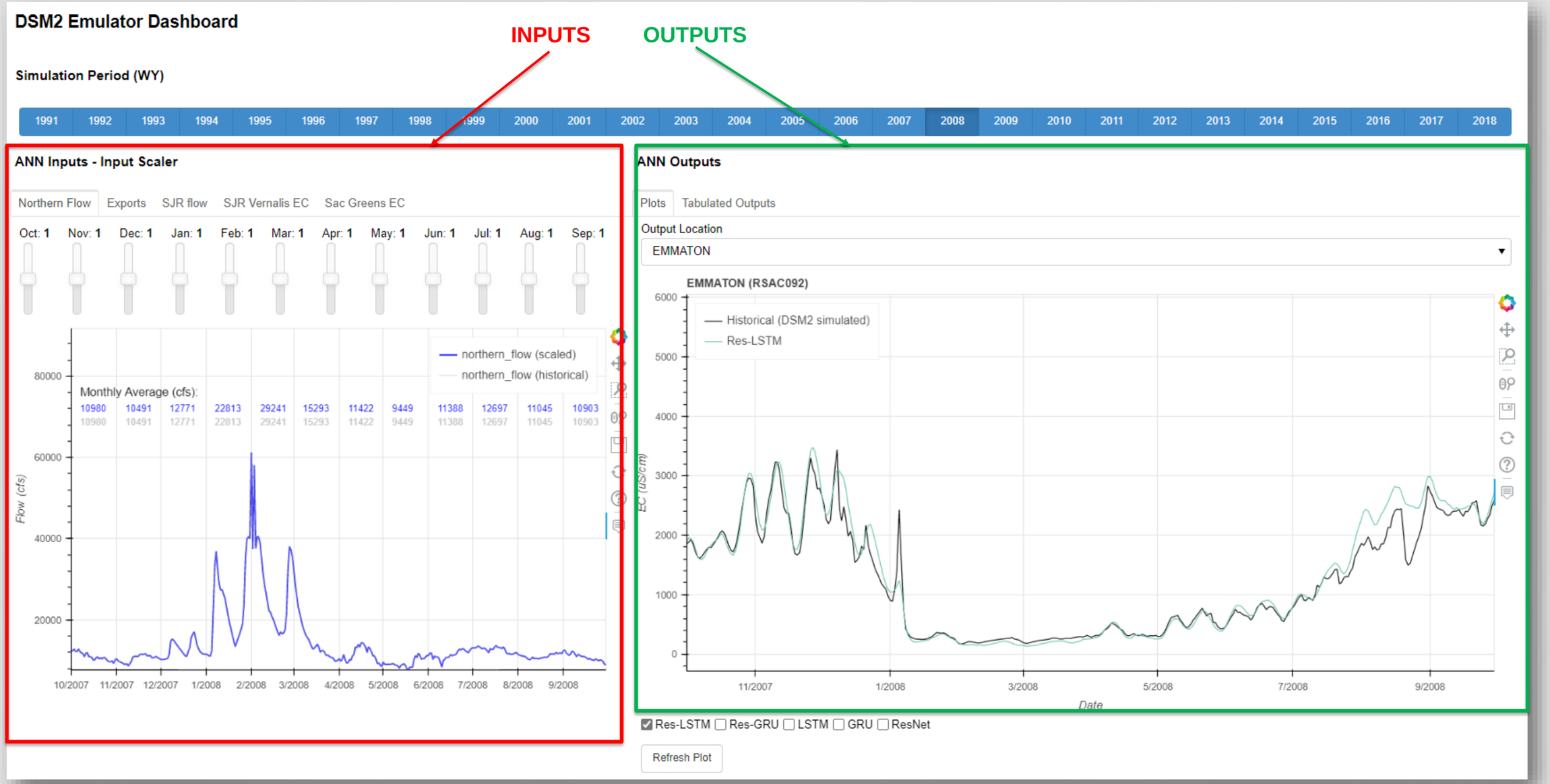
DSM2 Emulator Dashboard
INPUTS
OUTPUTS
Simulation Period (WY)
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
ANN Inputs - Input Scaler
Northern Flow
Exports
SJR flow
SJR Vernalis EC
Sac Greens EC
Oct: 1 Nov: 1 Dec: 1 Jan: 1 Feb: 1 Mar: 1 Apr: 1 May: 1 Jun: 1 Jul: 1 Aug: 1 Sep: 1
northern_flow (scaled)
northern_flow (historical)
Monthly Average (cfs):
10980 10491 12771 22813 29241 15293 11422 9449 11388 12697 11045 10903
Flow (cfs)
80000
60000
40000
20000
10/2007 11/2007 12/2007 1/2008 2/2008 3/2008 4/2008 5/2008 6/2008 7/2008 8/2008 9/2008
ANN Outputs
Plots
Tabulated Outputs
Output Location
EMMATON
EMMATON (RSAC092)
Historical (DSM2 simulated)
Res-LSTM
EC (uS/cm)
6000
5000
4000
3000
2000
1000
0
11/2007 1/2008 3/2008 5/2008 7/2008 9/2008
Date
Res-LSTM Res-GRU LSTM GRU ResNet
Refresh Plot

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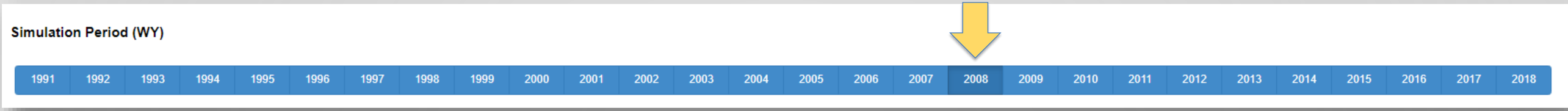
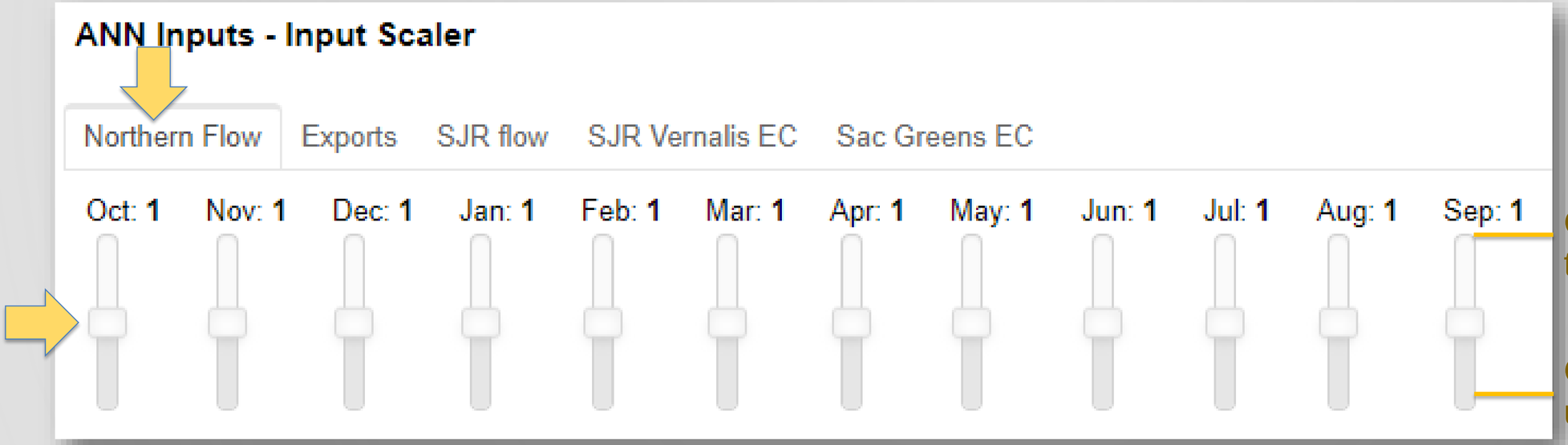
Input Modification Controls

Click to select simulation period by Water Year (October-September)



Click tab to parameter to be scaled, then adjust monthly scaling sliders



Can **increase** values by up to 20% (scale factor 1.2)

Can **decrease** values by up to 20% (scale factor 0.8)

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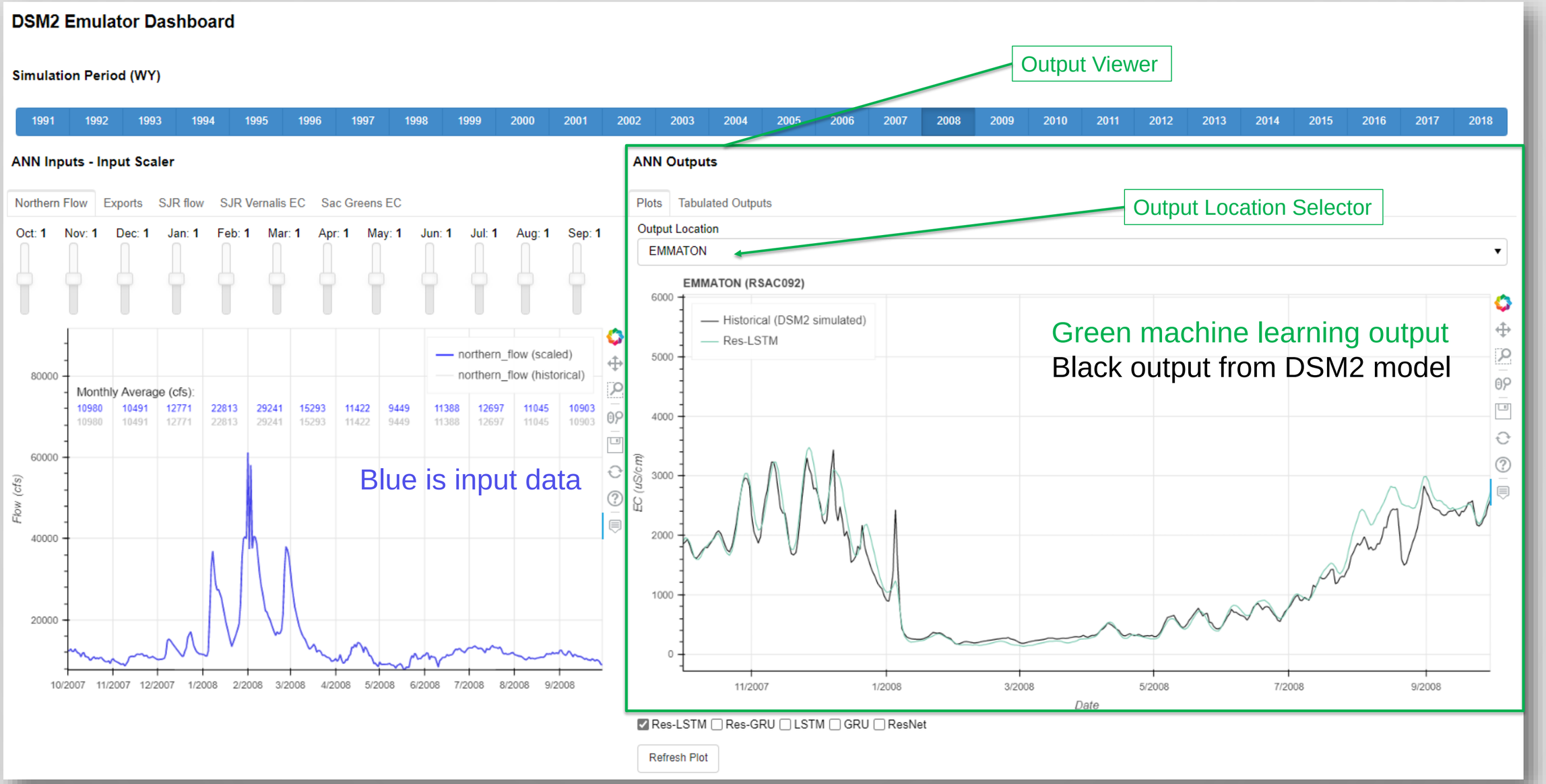

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Dashboard Access

dwrbdodash.azurewebsites.net

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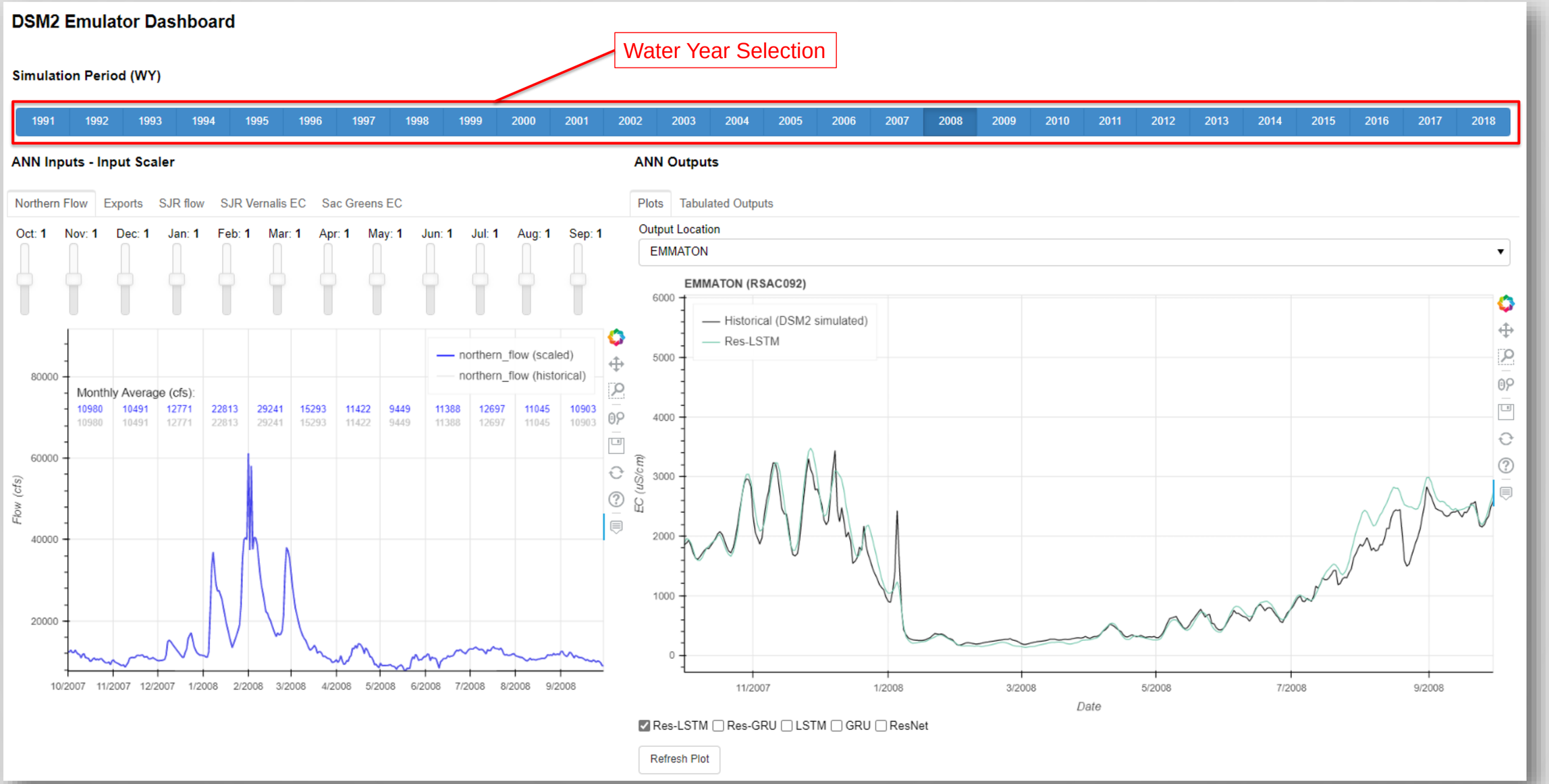

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Example: make a dry year even drier

Simulate a critically dry year, **like WY 2015**, where:

1. The **Dec inflow** from the northern sources are **reduced by 20%**, from milder precipitation events. Set **scale factor to 0.8**.

2. In **Mar-May**, the inflows from the northern sources are **reduced by 15%,** due to lower spring runoff. Set **scale factor to 0.85**.

3. To maintain the EI ratio, **reduce the exports in Mar-May by 15 %.** Set scale factor to 0.85.

Under the above conditions, what is the EC at Old River at Bacon Island?

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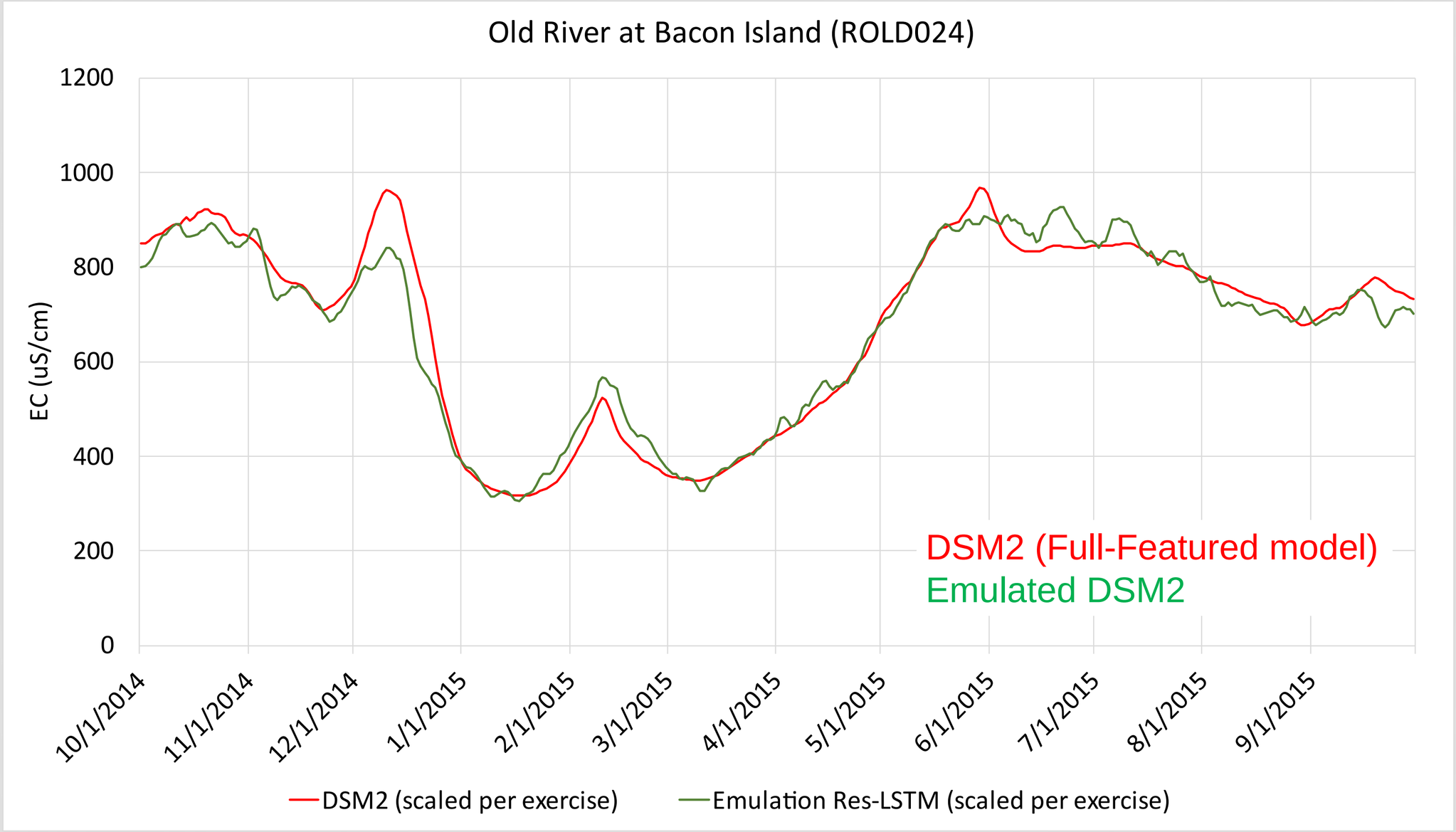
Results of the Example Scenarios (DSM2 vs. Emulation)



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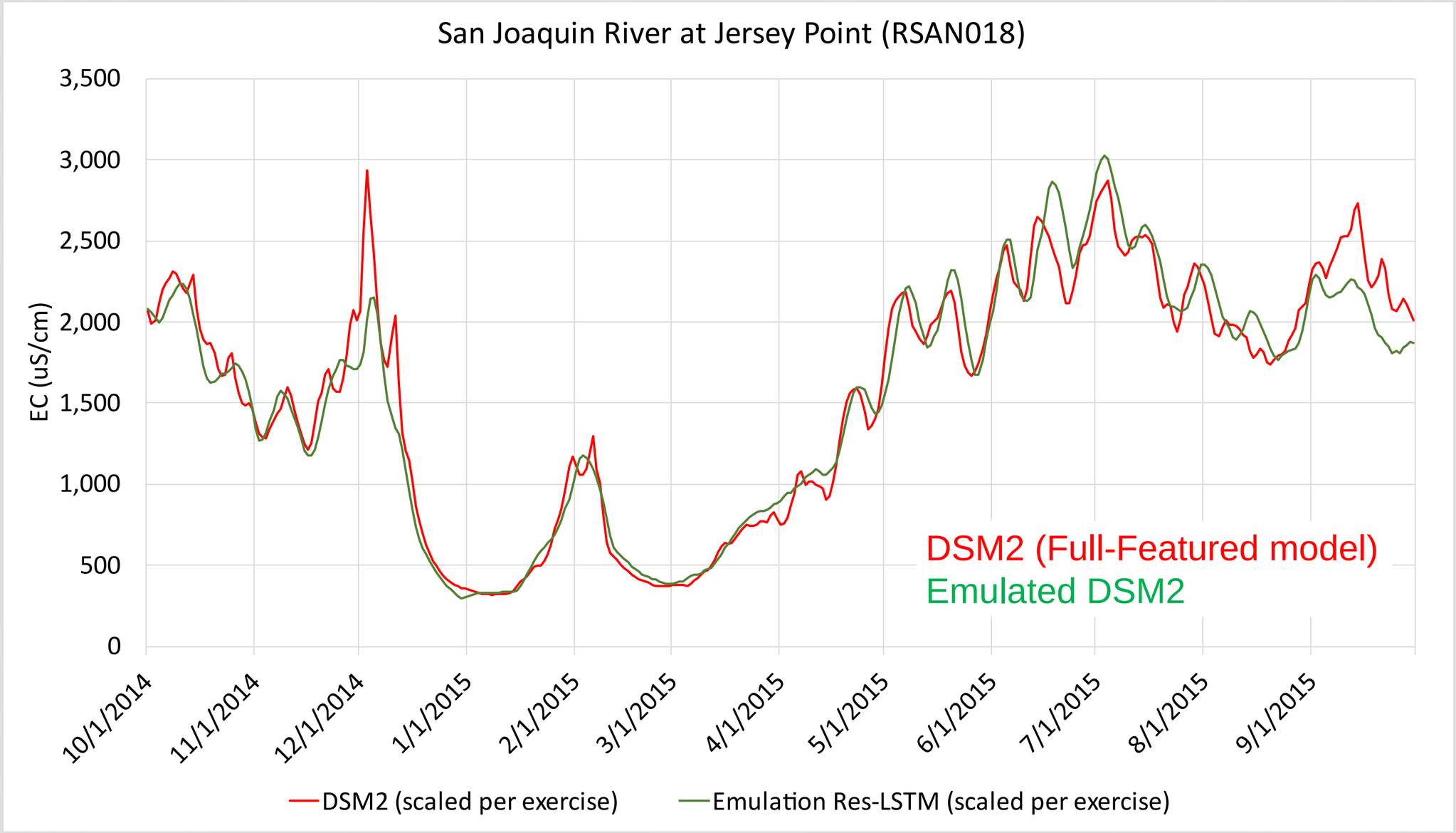

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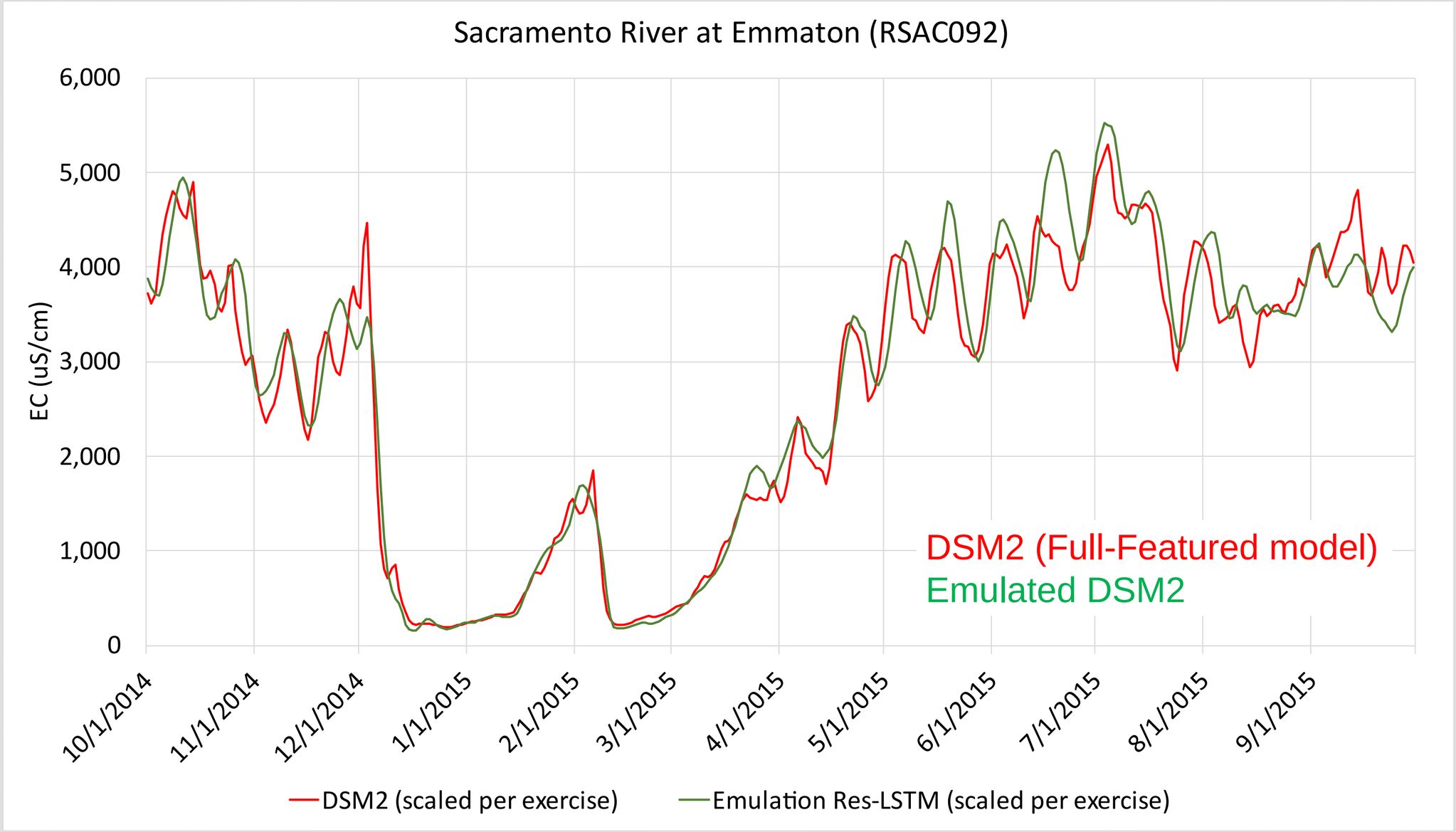

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