



# Corrosion informed costing

Carson Tucker,<sup>a</sup> Meagan Mauter<sup>a</sup>

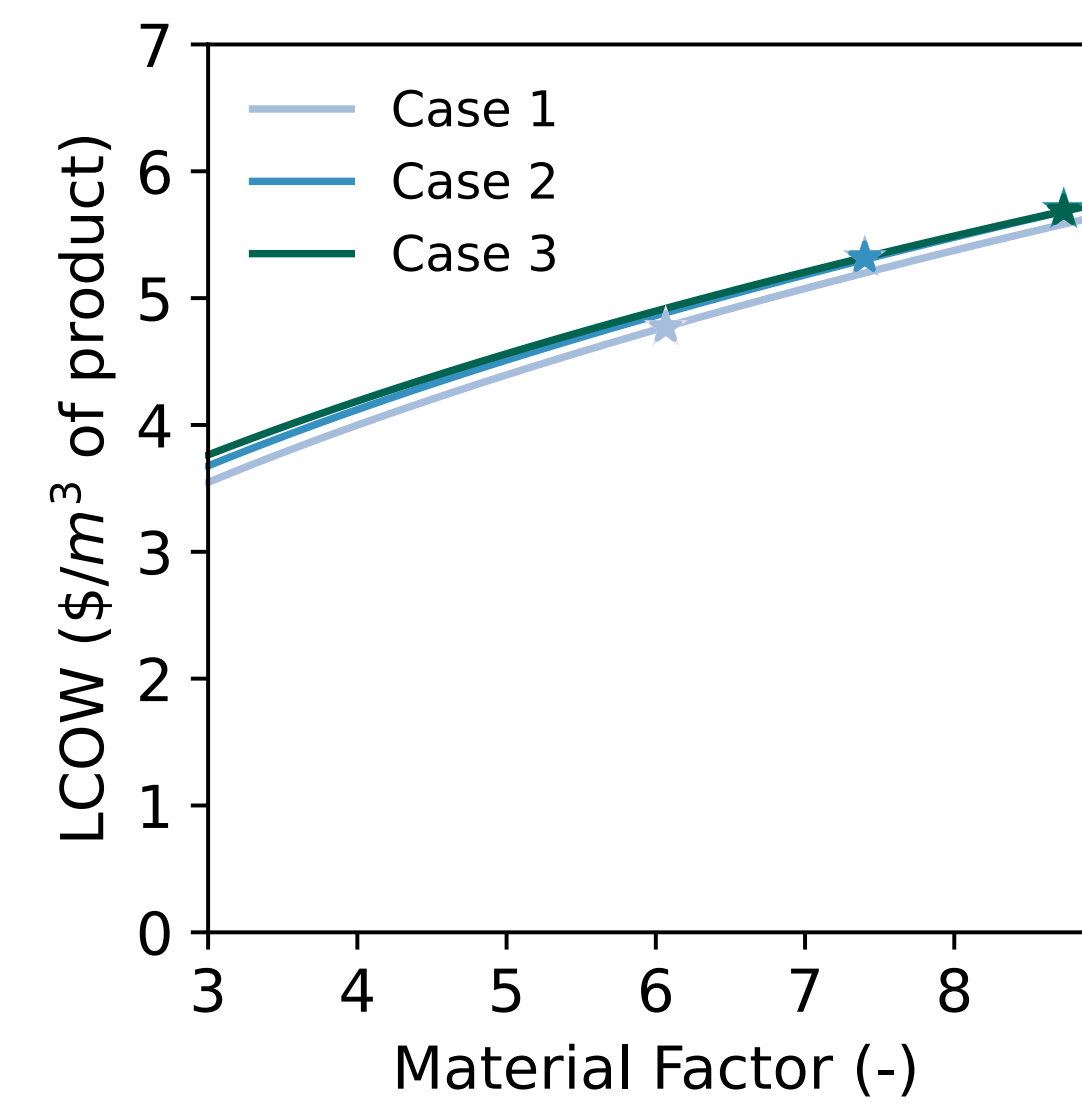
<sup>a</sup> Stanford University

## Background

- Corrosion is a significant challenge when treating waters at high concentrations, particularly in thermal processes
- Preventing corrosion requires selection of materials that are corrosion resistant at specific operating conditions
- Implementing cost functions that account for material selection to prevent corrosion will enable WaterTAP models to better balance trade-offs between operating conditions and material costs

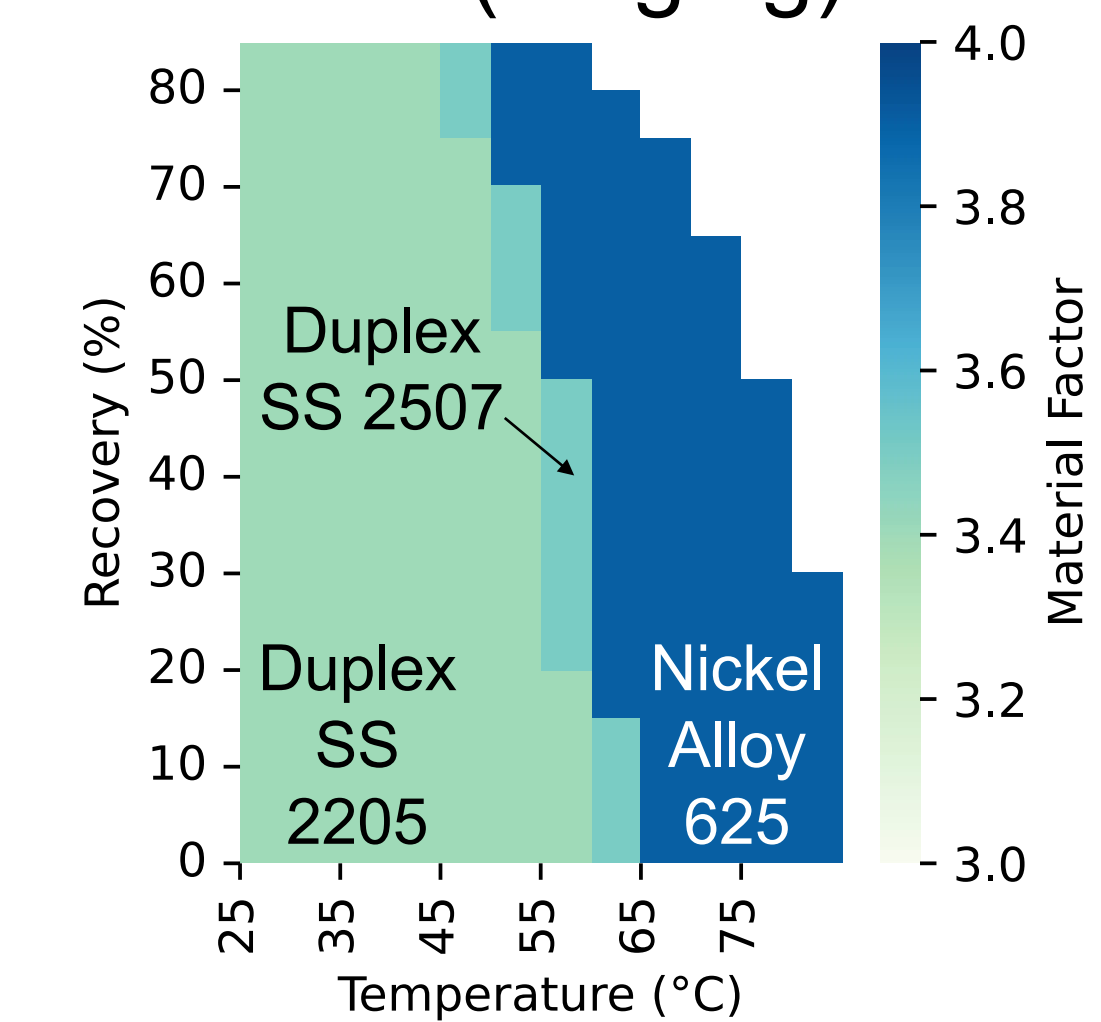
## Motivation

- Material factor  $F_m$  (costing multiplier to account for cost of different materials) impacts the LCOW of MVC significantly, so need to account for effects of corrosion in determining the material factor



## Results

- Material factor corresponding to lowest cost, corrosion resistant material across temperature and recovery for seawater (35 g/kg)



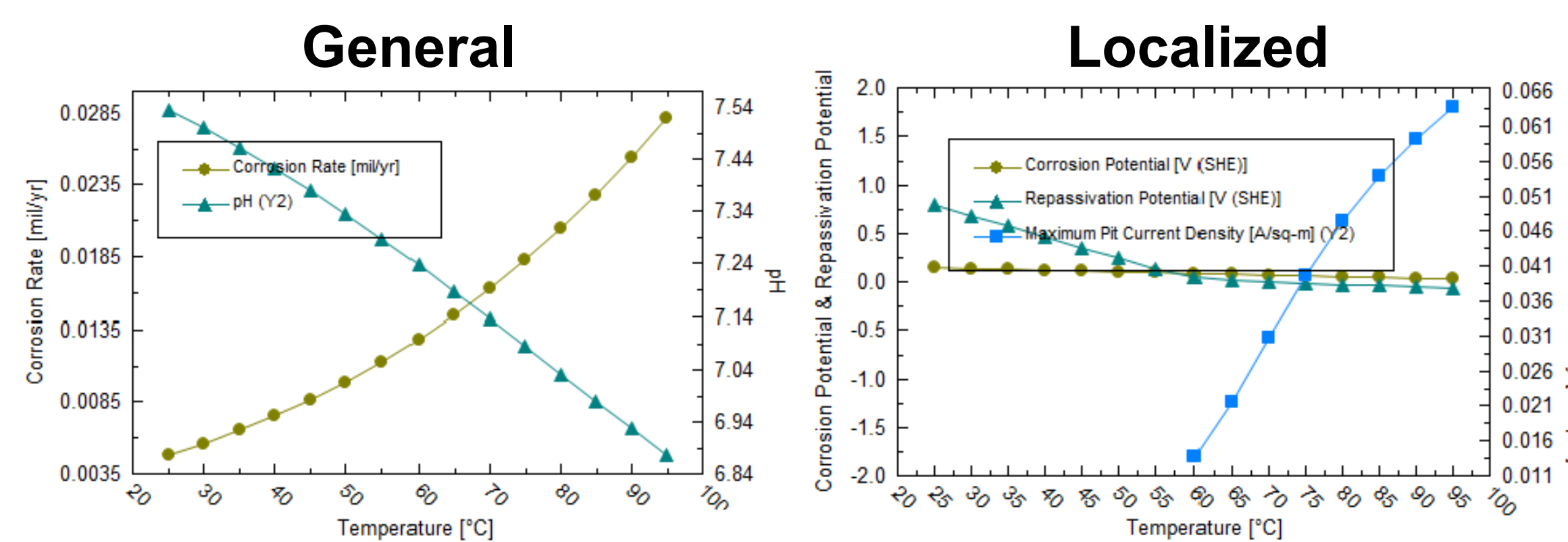
- May be overestimating material costs at lower brine salinities (by 15% below) and underestimating at higher brine salinities and temperatures

Case (seawater)	Recovery (%)	Temperature (C)	Material Factor (-)	LCOW (\$/m³)
Original $F_m$ estimate			3.9	3.85
Corrosion informed $F_m$	70	75	3.4	3.25

## Methods

### OLI Corrosion Analyzer

- Predicts general corrosion rate and localized corrosion



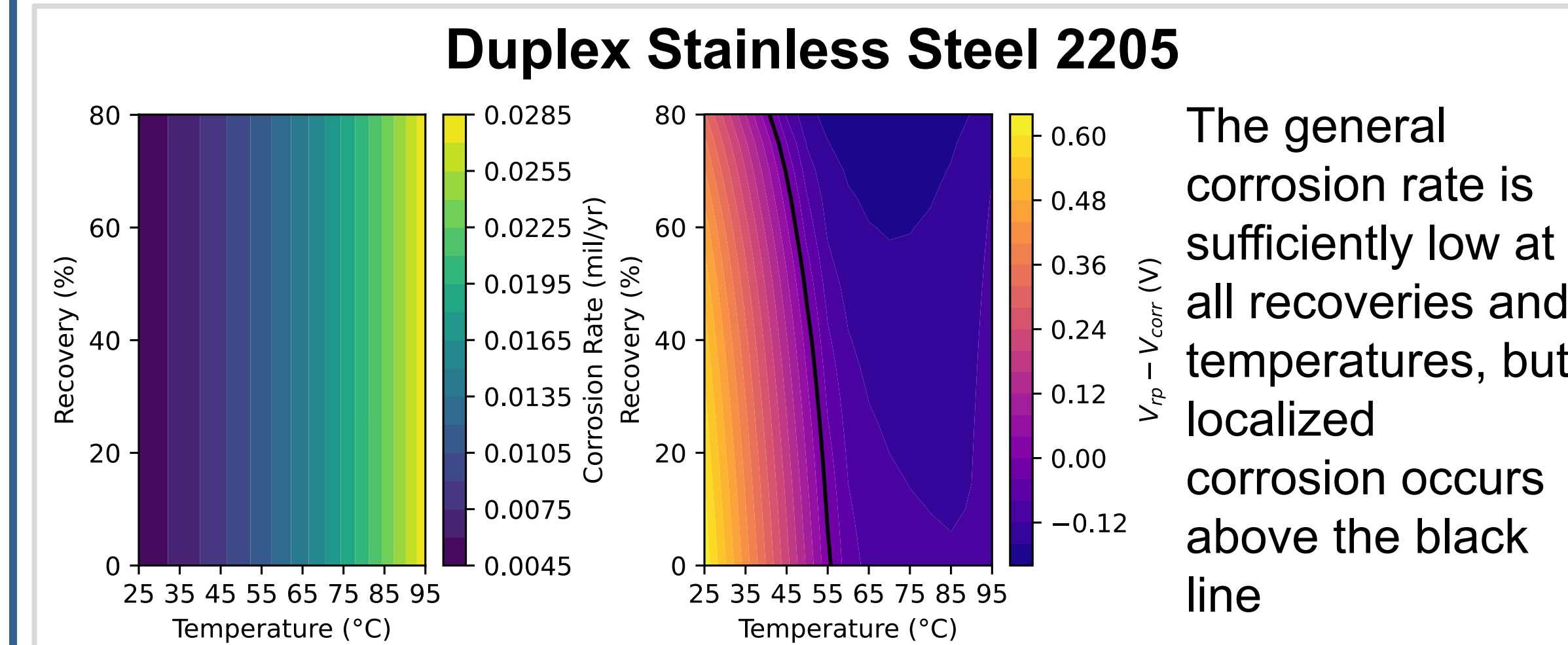
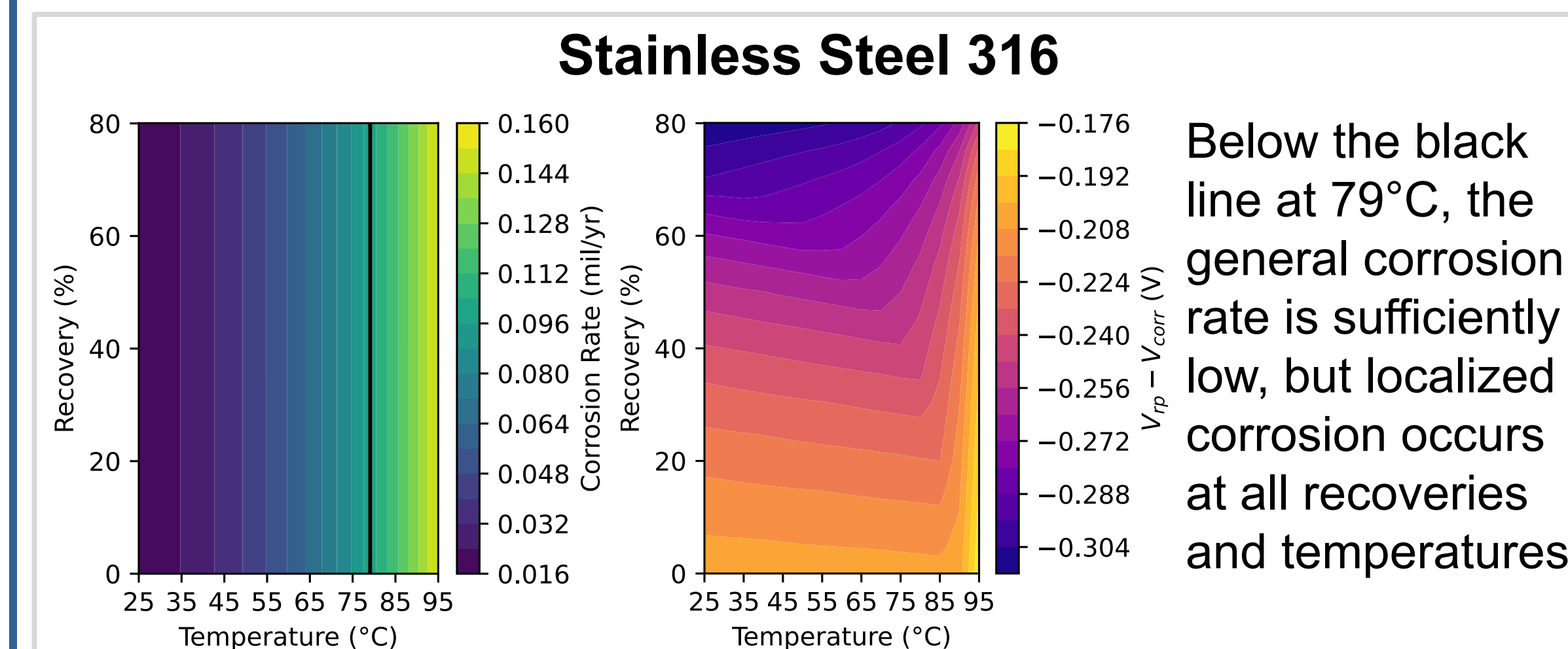
Temperature survey for seawater with duplex stainless steel 2205

- Conducted parameter sweeps for seawater

Parameter	Range
Temperature	25-95 C
pH	3-8
Recovery	0-80%
Dissolved oxygen	0-10 ppm
Flow	static, pipe flow, agitated
Material	carbon steel 1018 → stainless steel 304/316 → duplex stainless steel 2205/2507 → nickel alloys 625/825

### Material Selection

- Select materials with a general corrosion rate less than desired threshold and where no localized corrosion occurs



## Future work

- Use surrogate models to consolidate corrosion parameter sweep into a new material factor function for the evaporator and heat exchangers
- Quantify how much considering corrosion in the material selection impacts pretreatment and the LCOW of MVC and other brine concentration processes that rely on heat exchangers

Contact: Carson Tucker, [carsont@stanford.edu](mailto:carsont@stanford.edu)

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