



Robust Design Optimization for Operational Profiles

MARINE – RA7: Vehicles & Vessels Technologies

January 31st , 2014

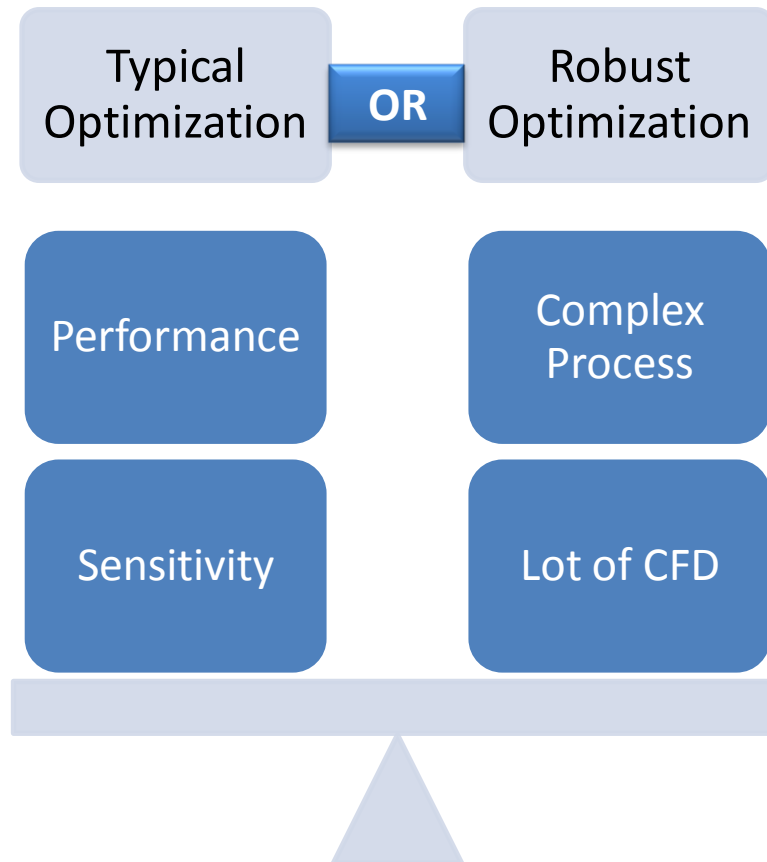


TRA Visions 2014



Objective

Which approach is particularly suited for hull form development?

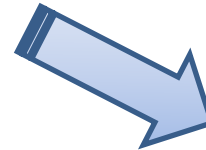


Tools used and focus of the optimization

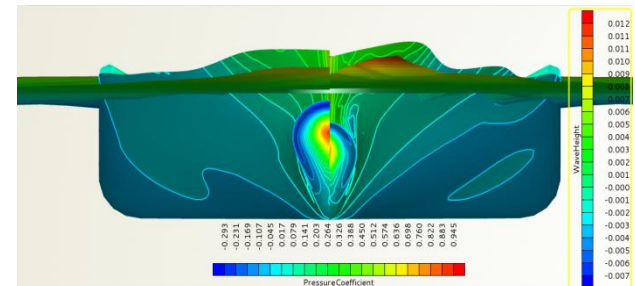
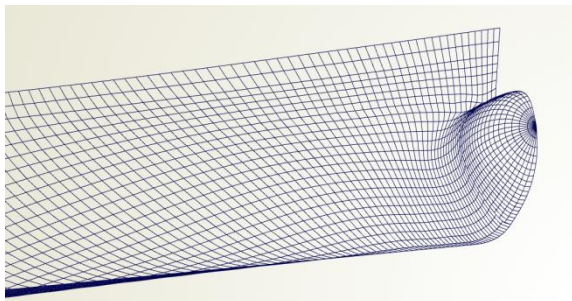
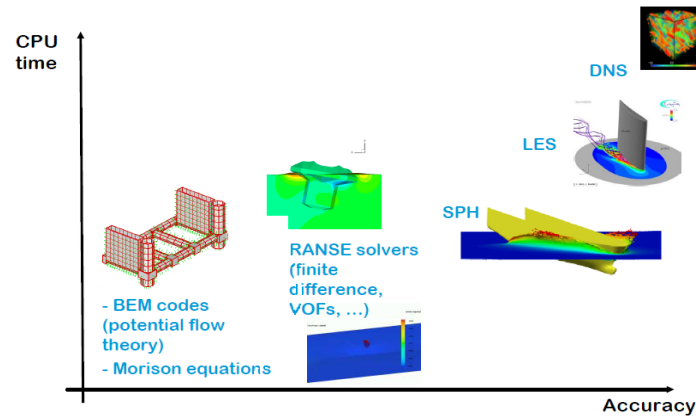
Big amount of CFD runs



Potential calculation [fast]

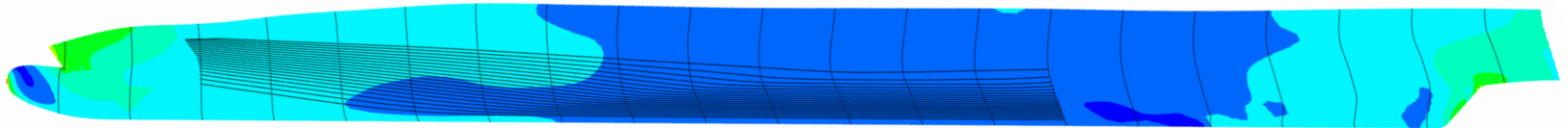
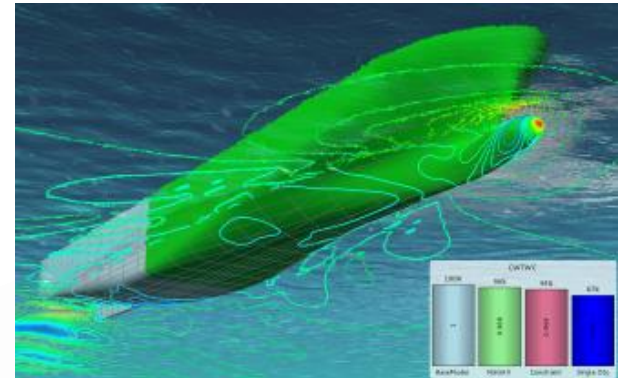


Forebody optimization



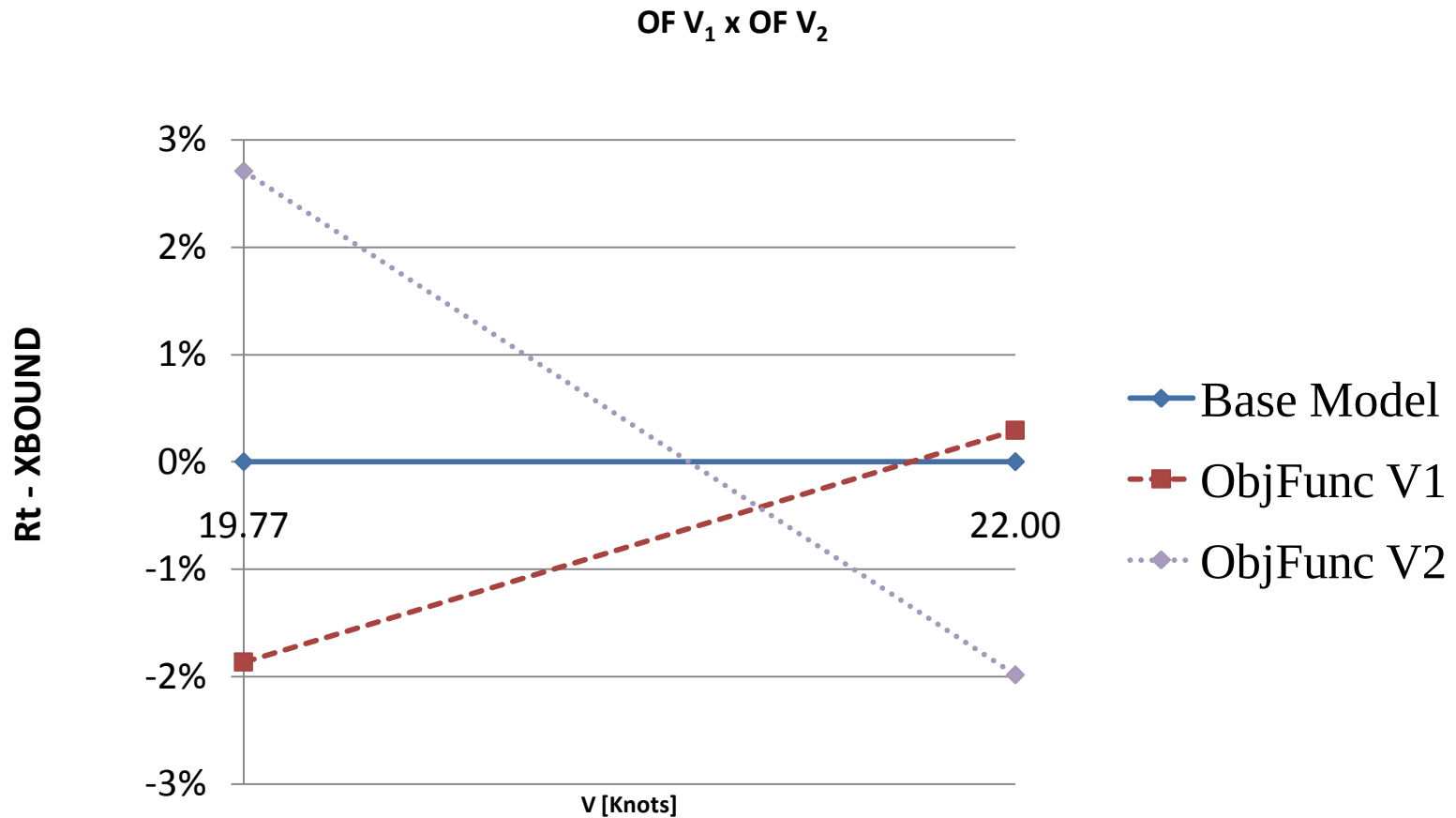
Problem setup

- 10 Design Variables
- R_{tV1} and/or R_{tV2} as objective
- Robustness: ΔT , $(6.2 \pm \Delta T)$
- CFD: Shipflow (Potential) ± 15 min each calculation

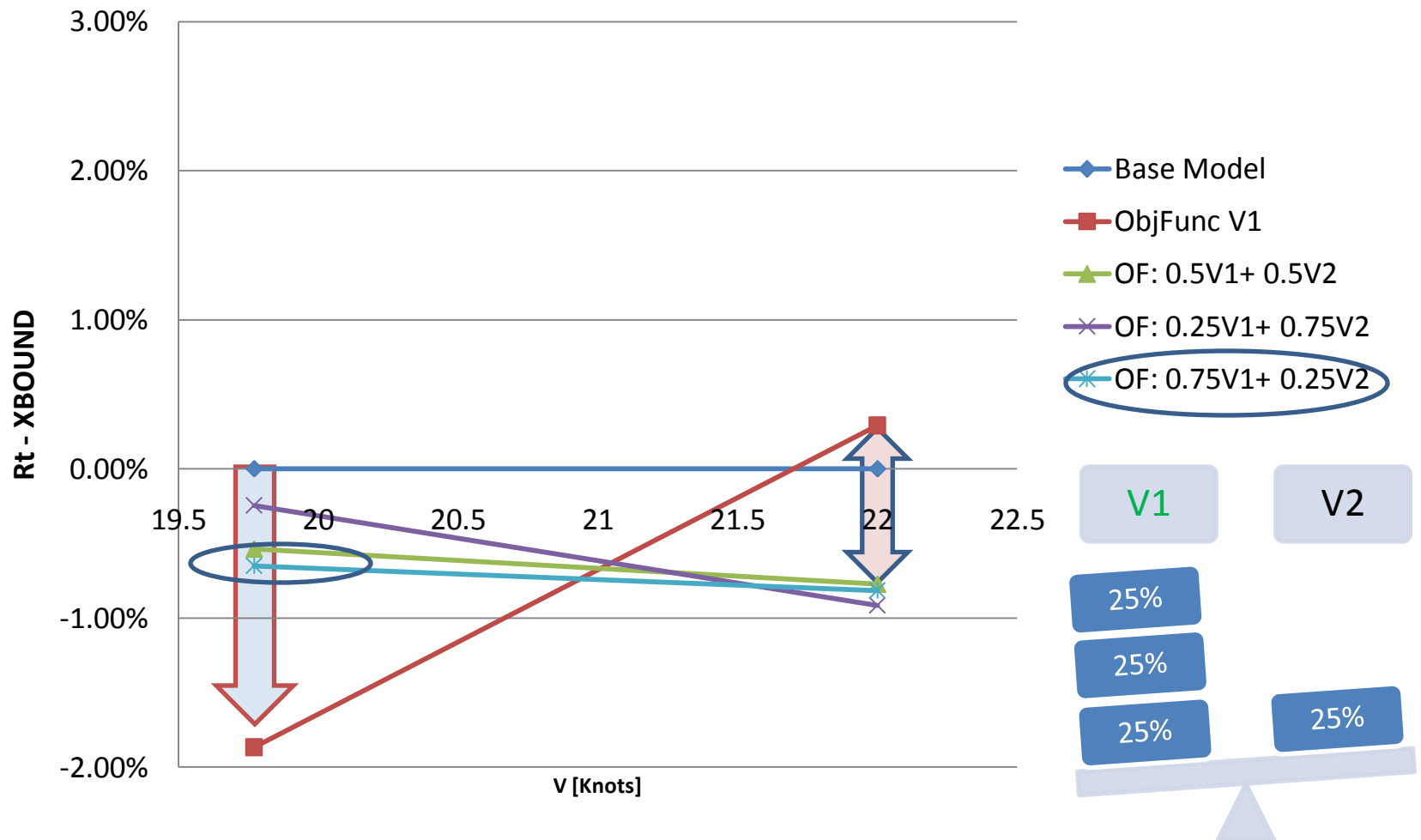


Single Objective Optimization

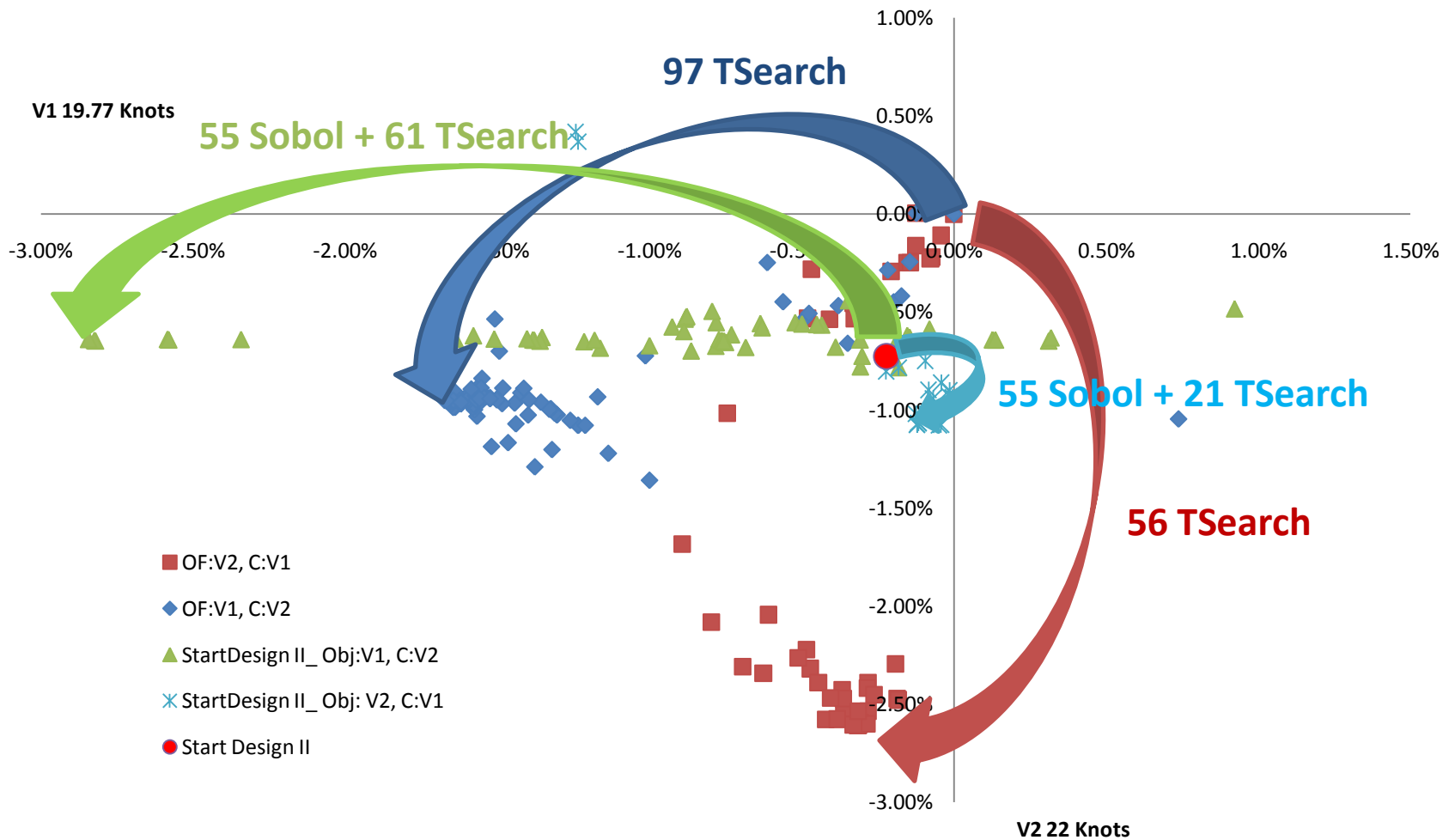
Gradient based method



Single Obj – Weighted Function

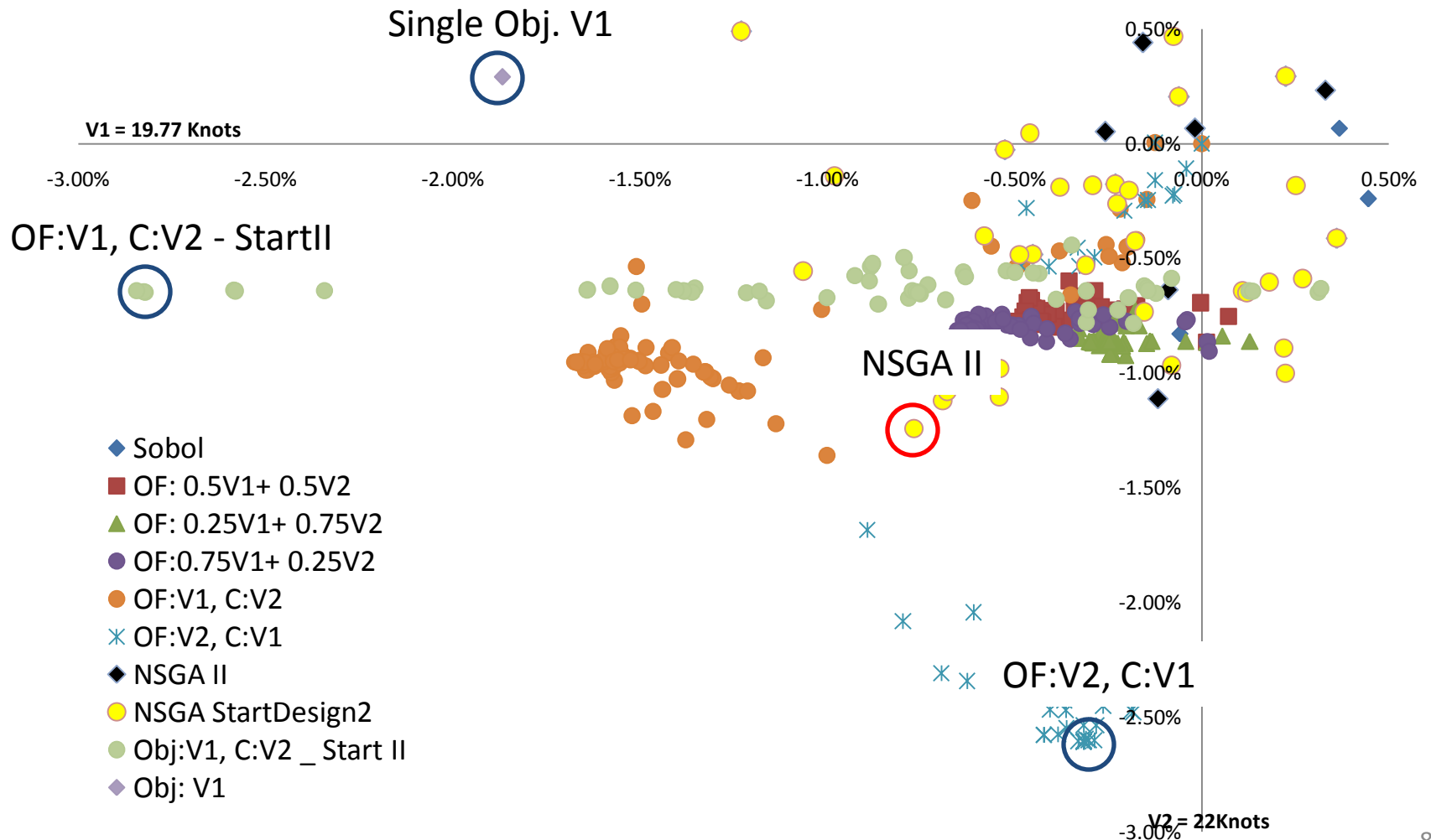


Single-Obj + Constraints



Multi-Objective Function

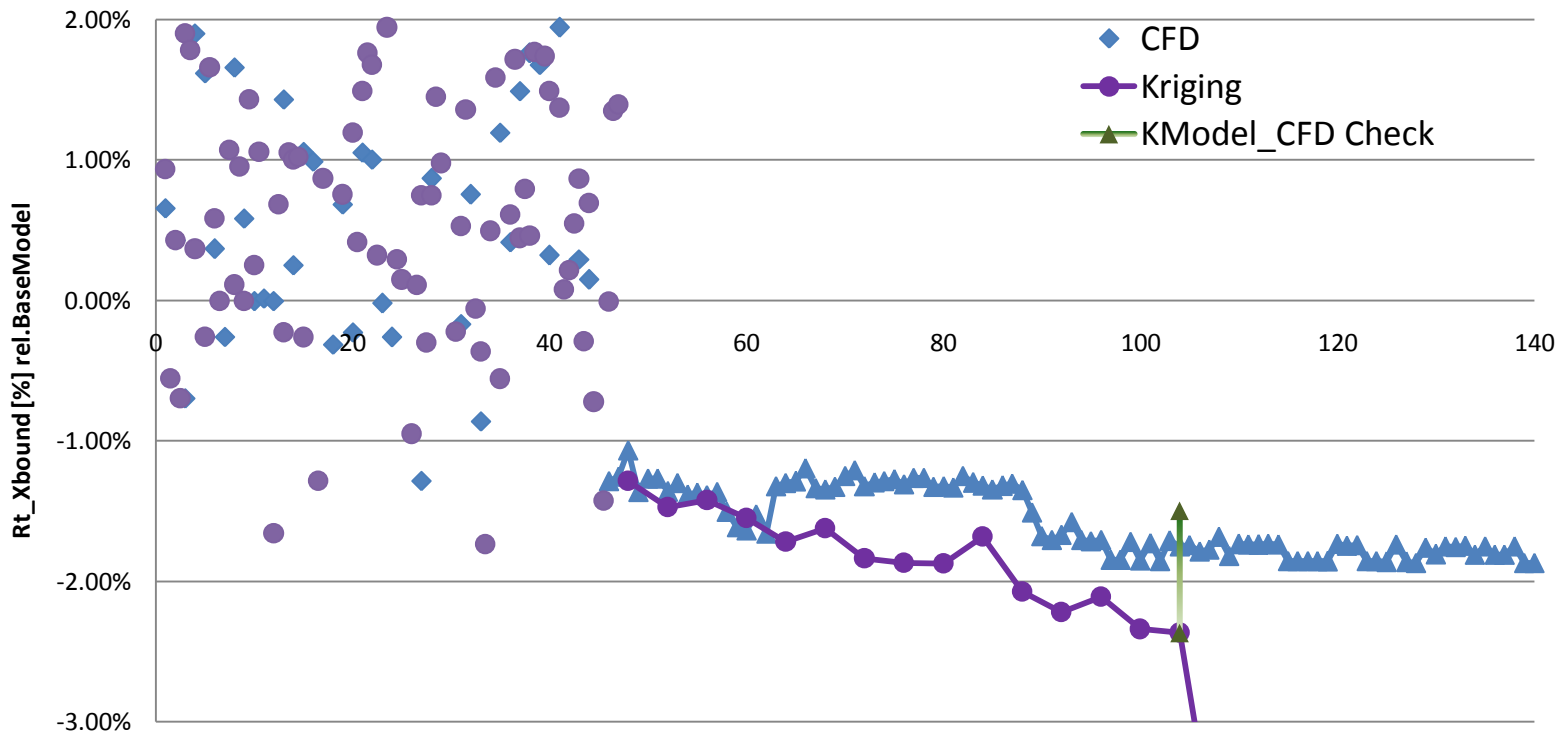
NSGA II



Gauss-Markov estimation - Kriging

Comparison with typical methods

Feasible solution with potential gaps for improvement



Reduced resistance via different optimization methods

- Appropriate optimization method defined
- Meta-models: solution to reduce number of analysis
- Sensitivity analysis suitable for some cases

