

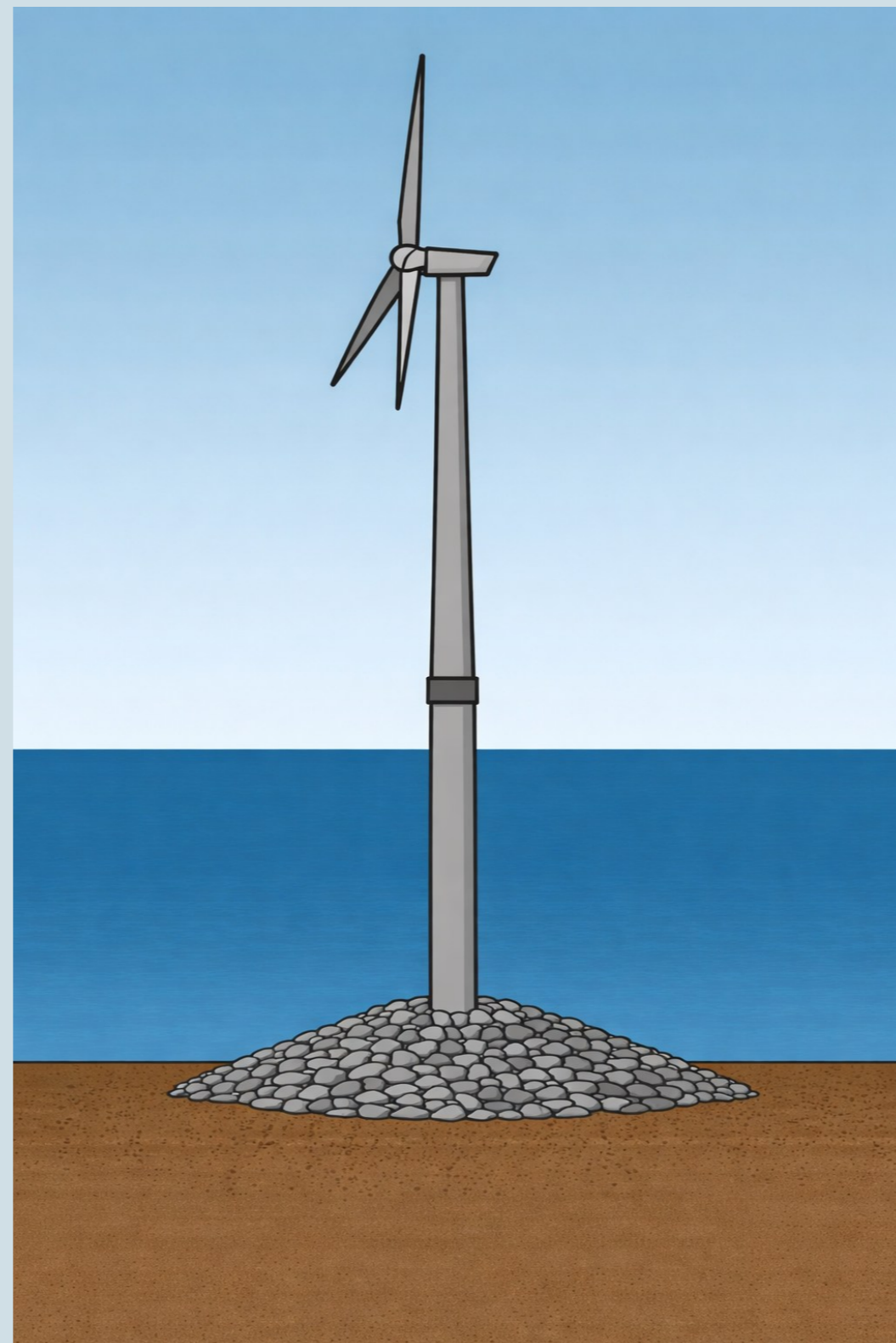
Scour Protection Solutions for Offshore Wind Monopiles

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Introduction

Monopile foundations:

- Commonly used solution in European offshore wind industry
- Vulnerable to scour – a local erosion of seabed sediment caused by flow changes around a structure
- Comparison of three design methods for mitigating scour, under identical 50-year return period wave conditions
- Parametric sensitivity analysis to identify main contributors of deviation between approaches



Methodology – compared design methods

De Vos Static Approach (2011)

- Traditional framework, focused on stopping all stone movement under extreme wave conditions

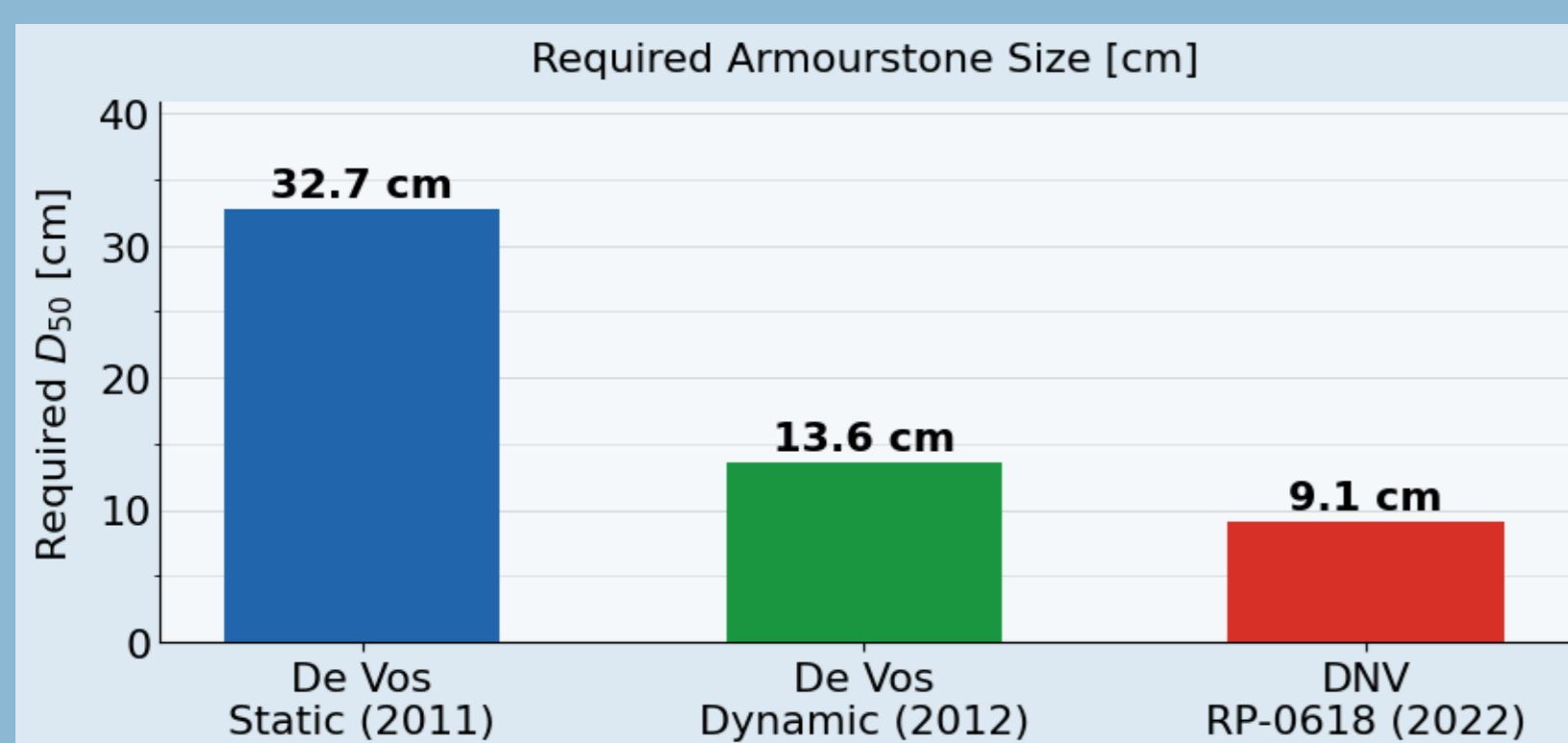
De Vos Dynamic Approach (2012)

- Permits controlled reshaping and accounts for cumulative storm damage through an empirical damage parameter

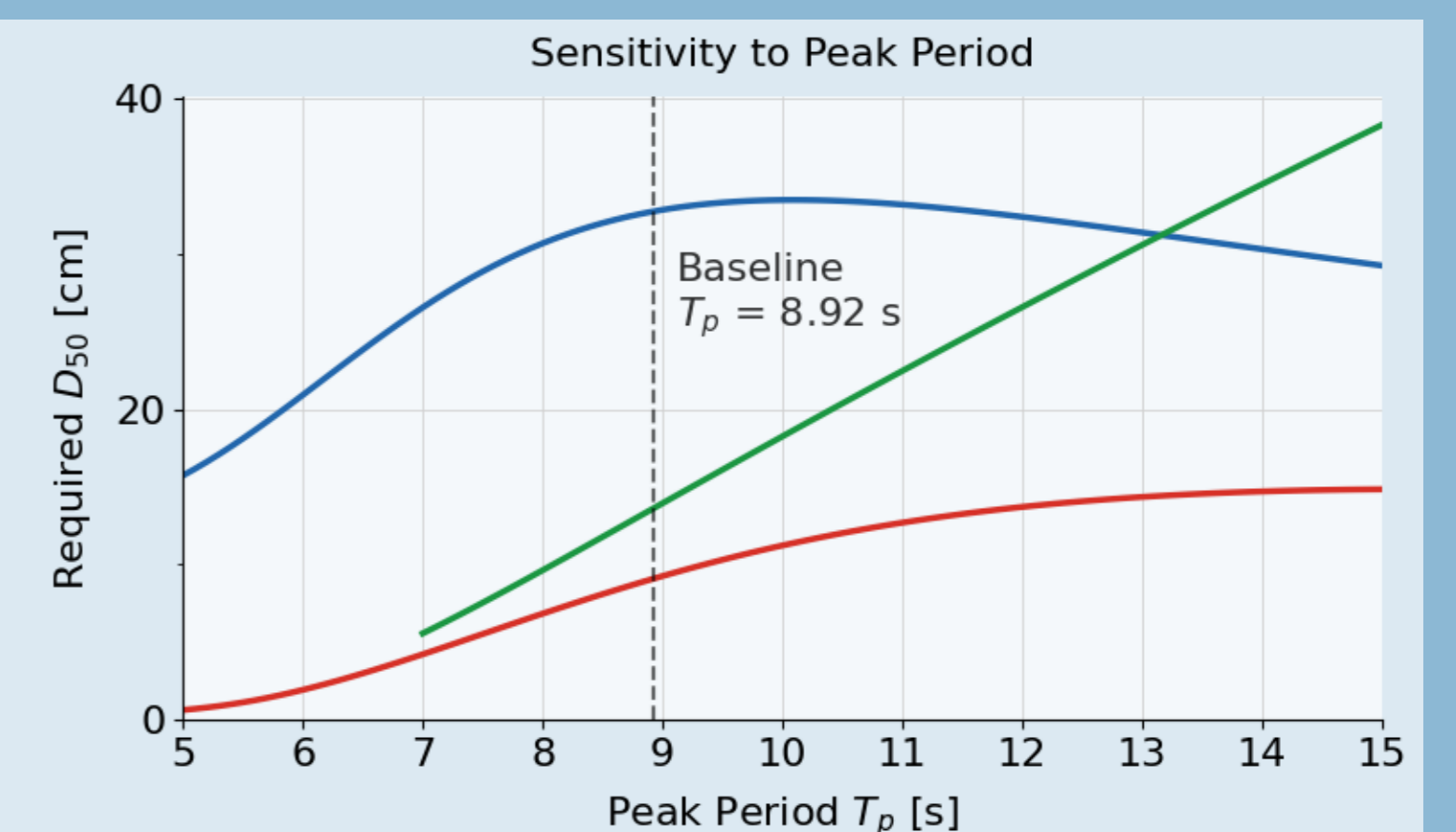
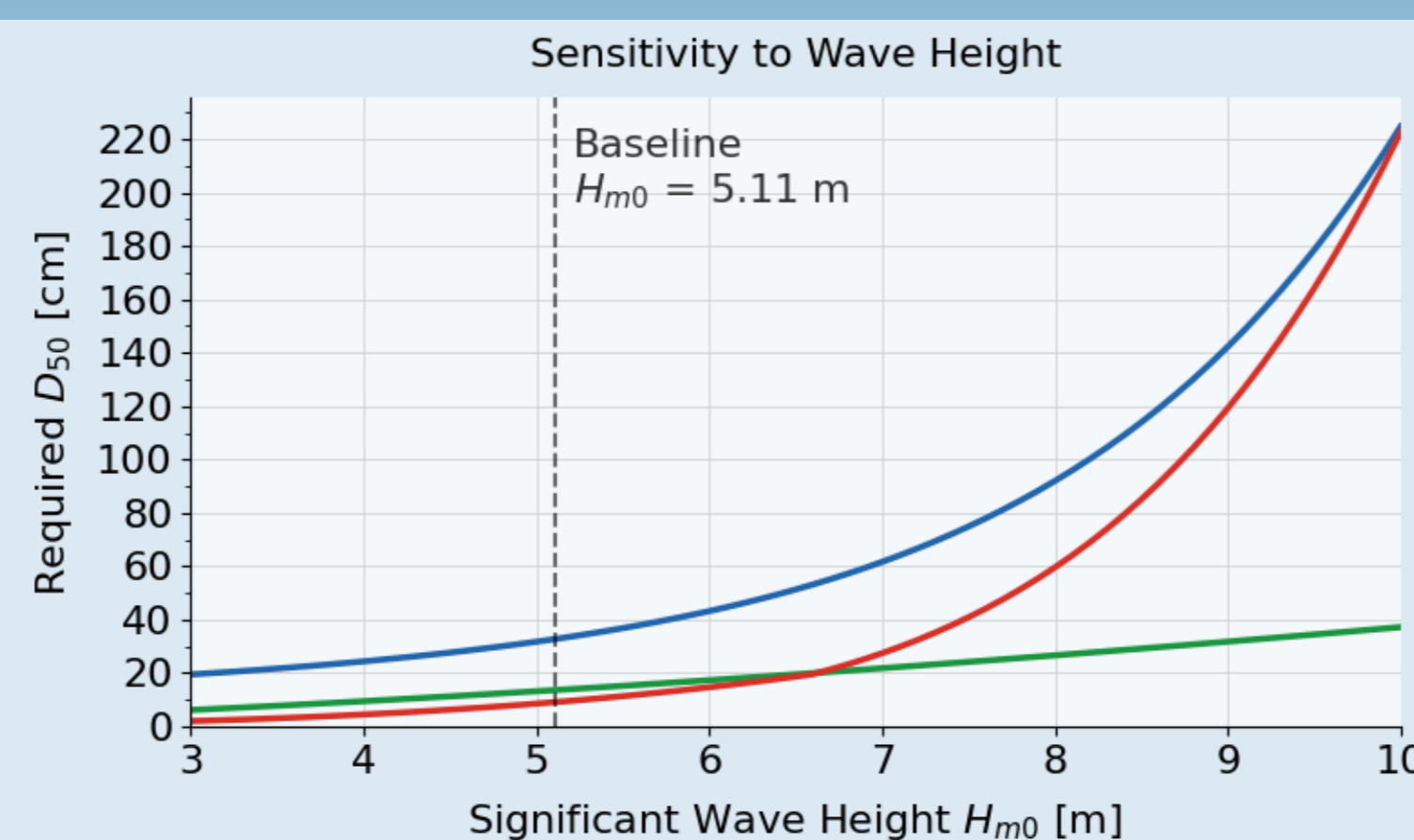
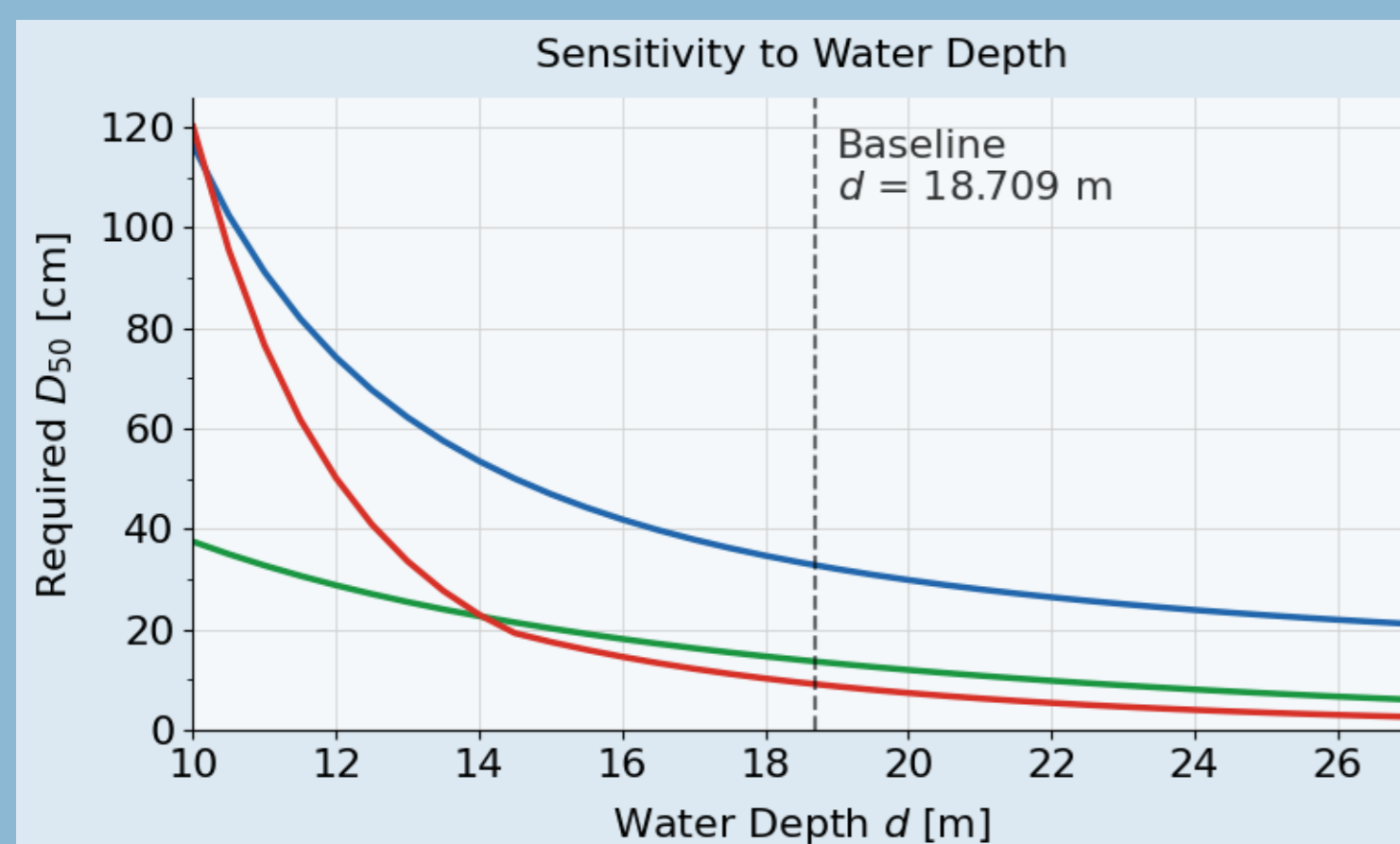
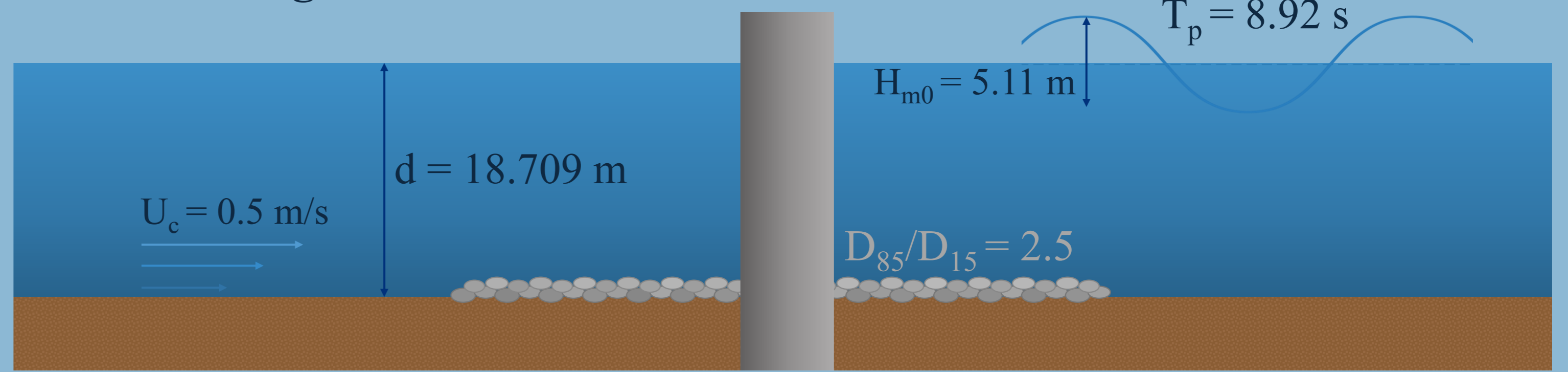
DNV RP-0618 Approach (2022)

- Introduced a mobility-based criterion using the Shields parameter, defining stability classes based on allowable stone movement

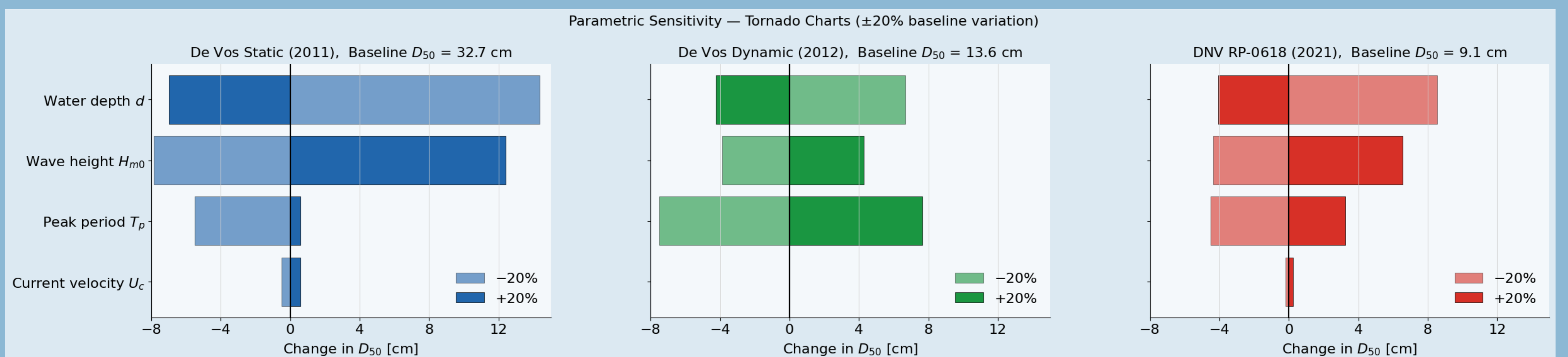
Results & Discussion



Baseline Design Parameters:



— De Vos Static (2011) — De Vos Dynamic (2012, $S_{3D}=0.5$) — DNV RP-0618 (2021)



Conclusion

- Significantly different armourstone sizes under identical baseline conditions between the three methods
- Method selection introduces more design variability than uncertainty in the metocean inputs themselves
- No single method is universally conservative or economical – selection should be site-specific

References

- De Vos, L. et al. (2011) “Empirical design of scour protections around monopile foundations,” *Coastal Engineering*, 58(6), pp. 540–553.
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