

INTEGRATED SITE INVESTIGATION FOR OFFSHORE WIND MINIMUM RESOLUTION CONE PENETROMETER TEST PARAMETERS

Introduction

2000 GW of global offshore wind by 2050 ^[1]

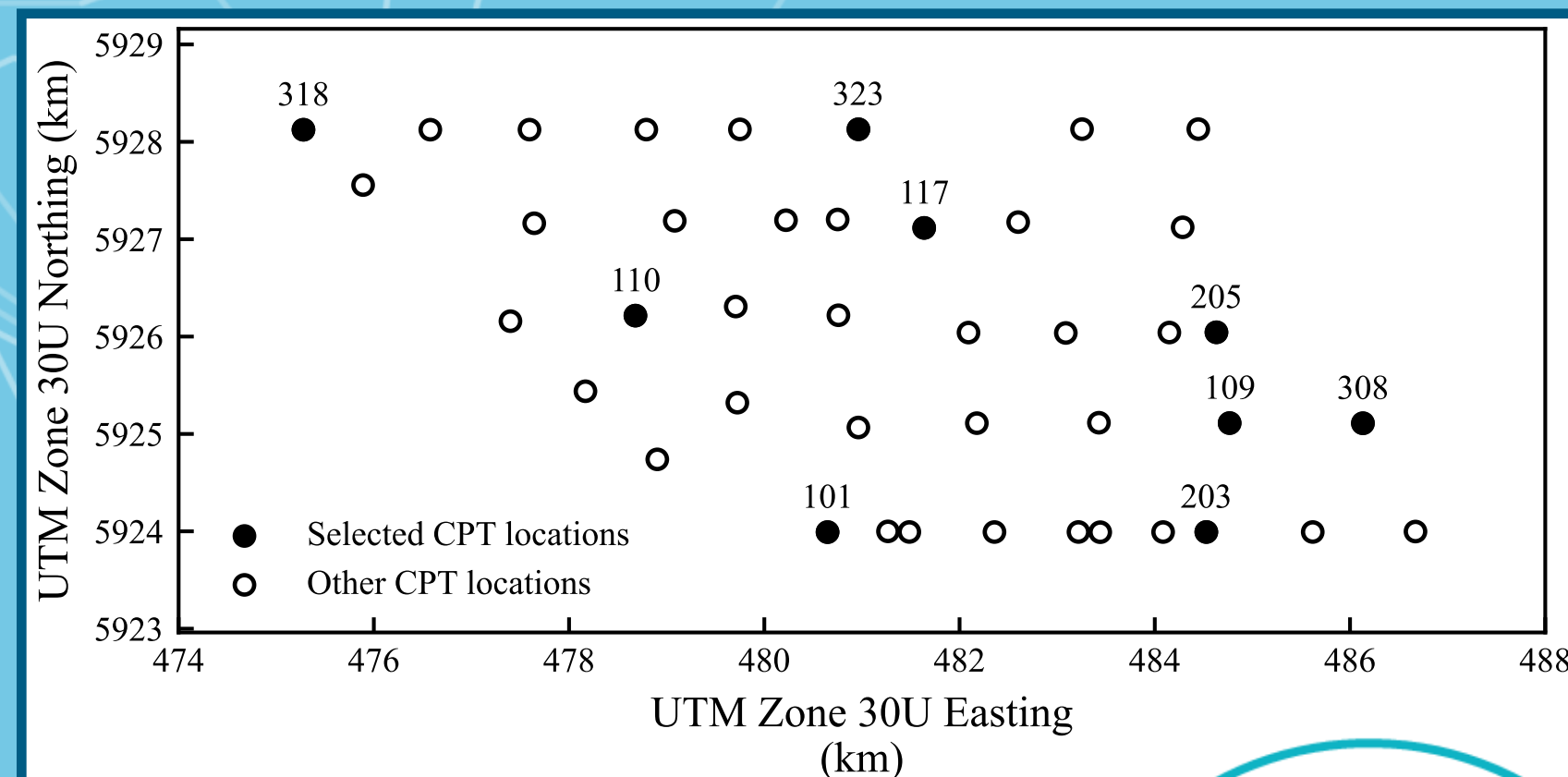


x6.5 rate of design & construction of wind turbines ^[1]

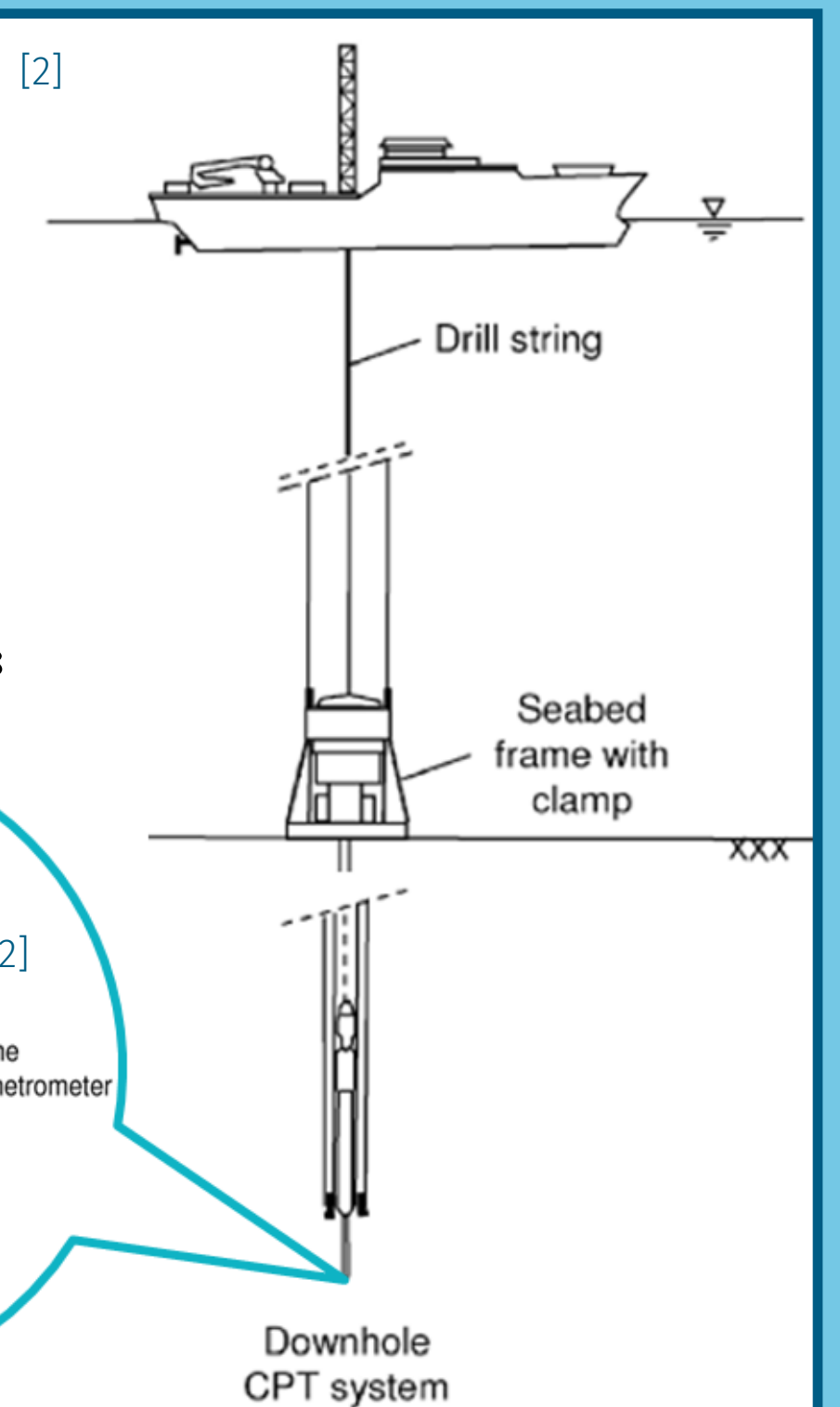
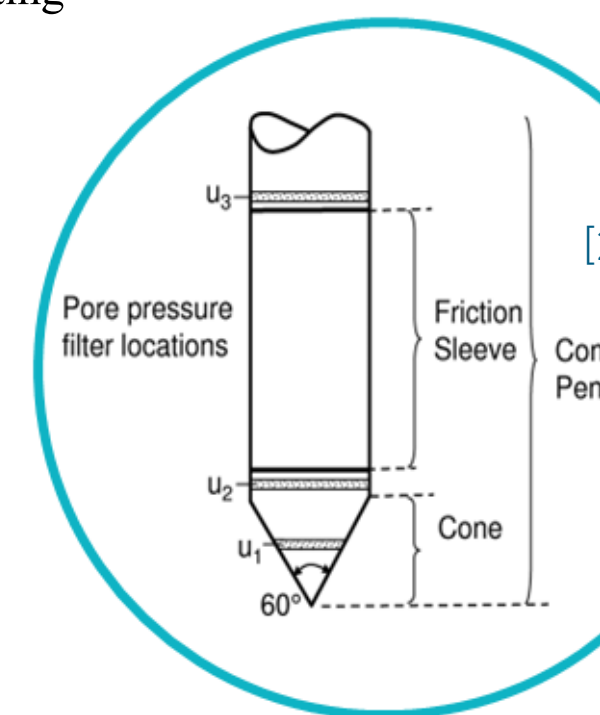


Innovative site investigation methods: lower resolution synthetic CPTs to reduce demand for tests

Site Characterisation

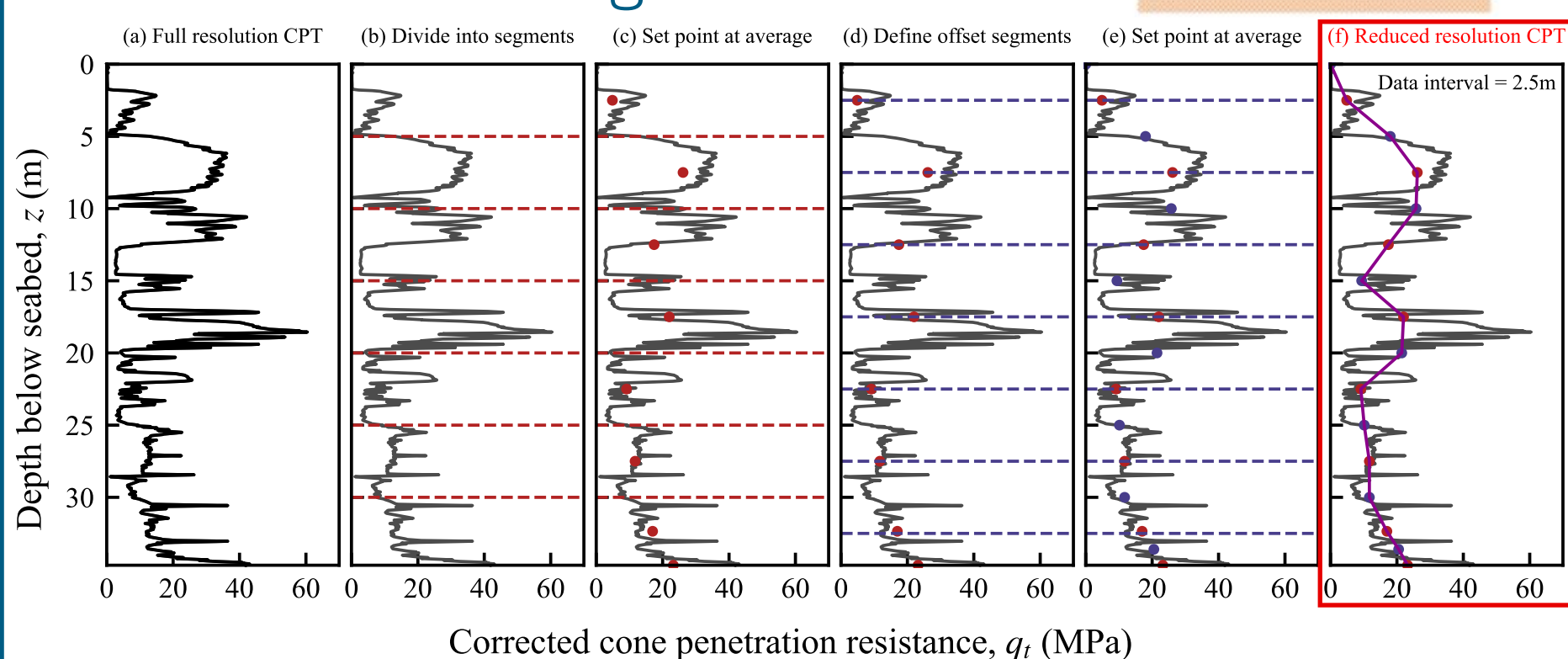
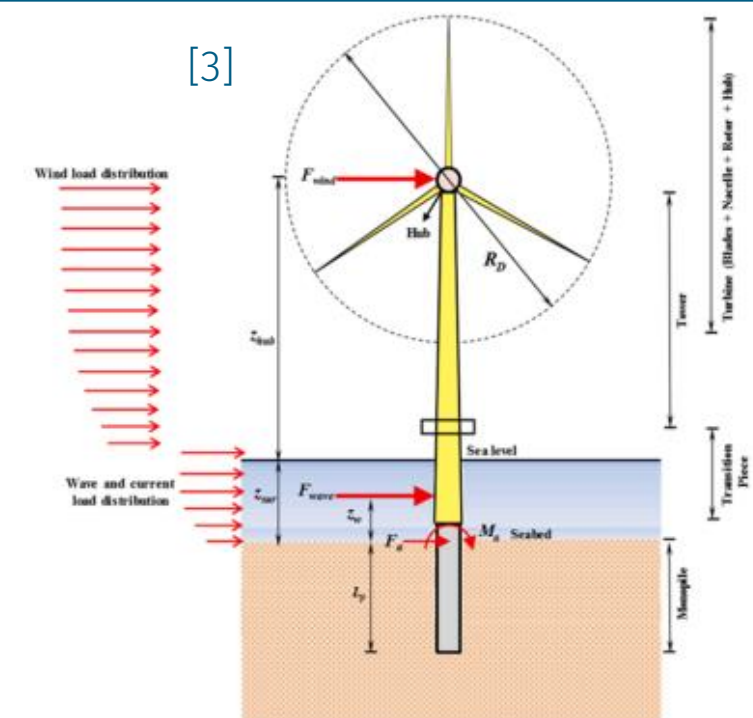


Cone penetrometer tests (CPT) measure continuous soil resistance (q_t) with depth (z) and are carried out at discrete locations across a site.



Method

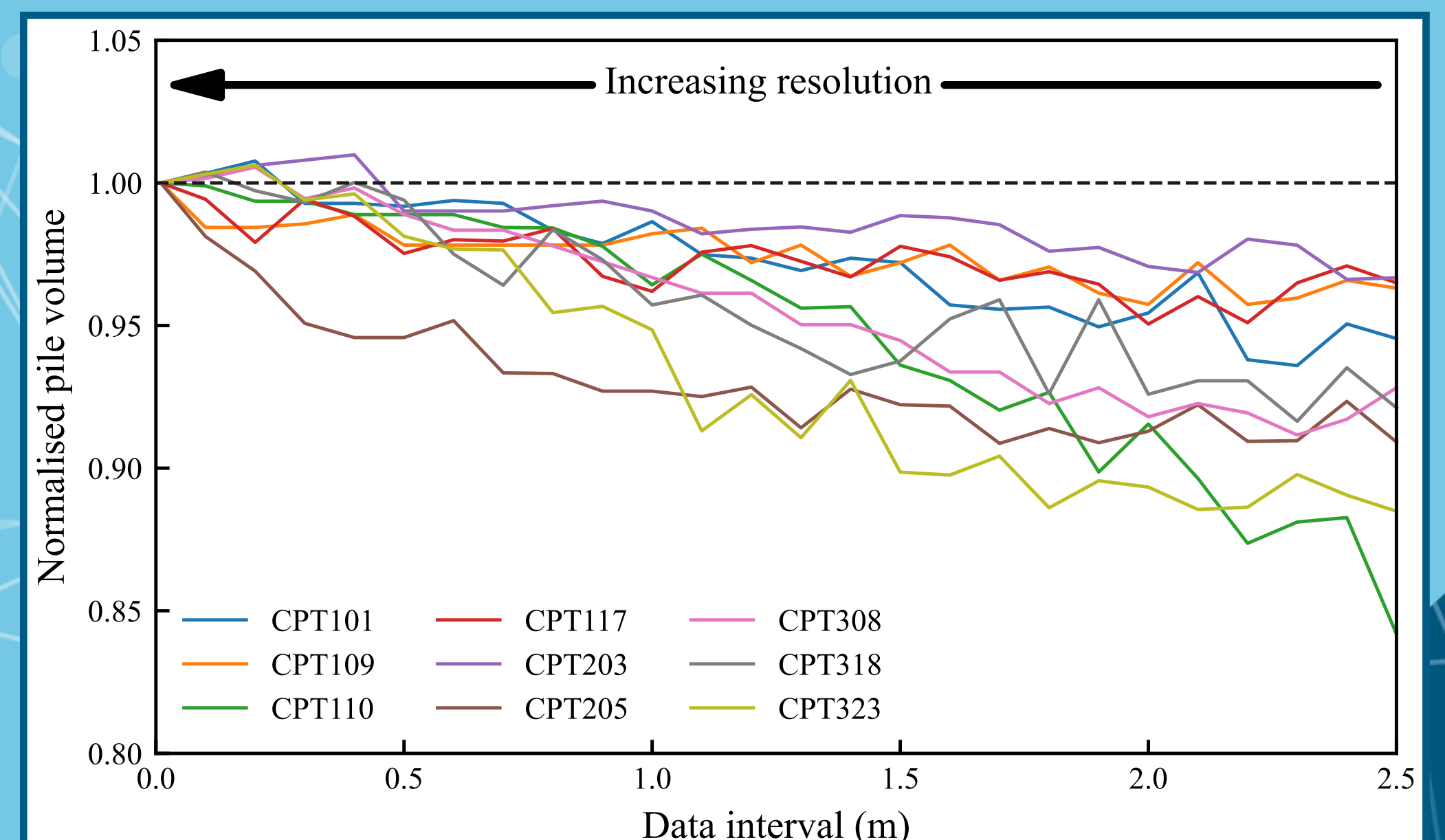
To replicate synthetic CPTs, reduce resolution of CPT profiles by increasing the data interval. Calculate the minimum monopile volume that can withstand ULS lateral loading.



Further Work

Defining complexity of full resolution CPT profiles, from which the minimum acceptable resolution can be found to ensure reliable design outcomes.

Results and Discussion



Lower resolution CPT data increases uncertainty in design outcomes and leads to unconservative designs for piles. However, up to a data interval of 0.5 m, pile volume tends to remain within 2.5% of the full resolution volume.

References

- [1] GWEC (2024) Global Offshore Wind Report 2024, Global Wind Energy Council.
- [2] Randolph, M. and Gourvenec, S. (2011) Offshore Geotechnical Engineering. 1st edn, CRC Press.
- [3] Gupta, B. K. and Basu, D. (2020) 'Offshore wind turbine monopile foundations: Design perspectives', Ocean Engineering.