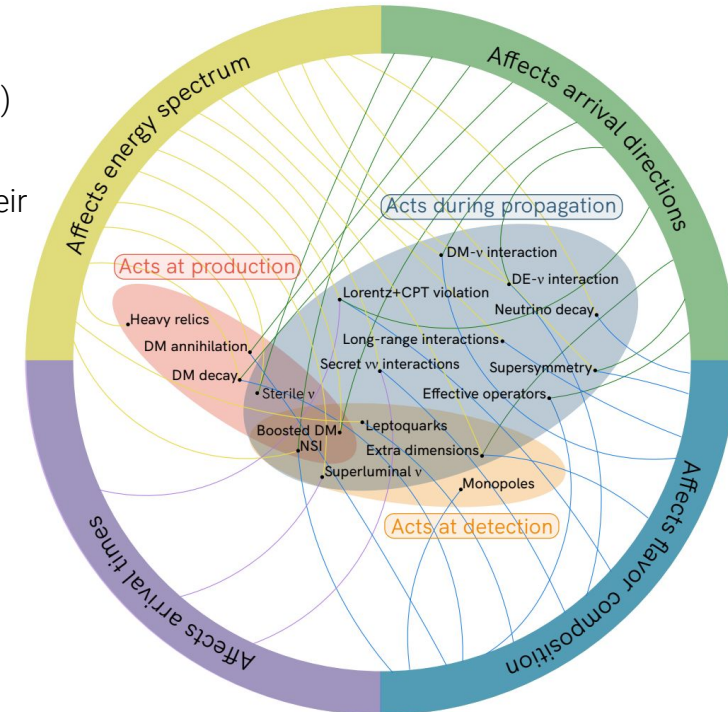


Key physics deliverables of future neutrino telescopes:

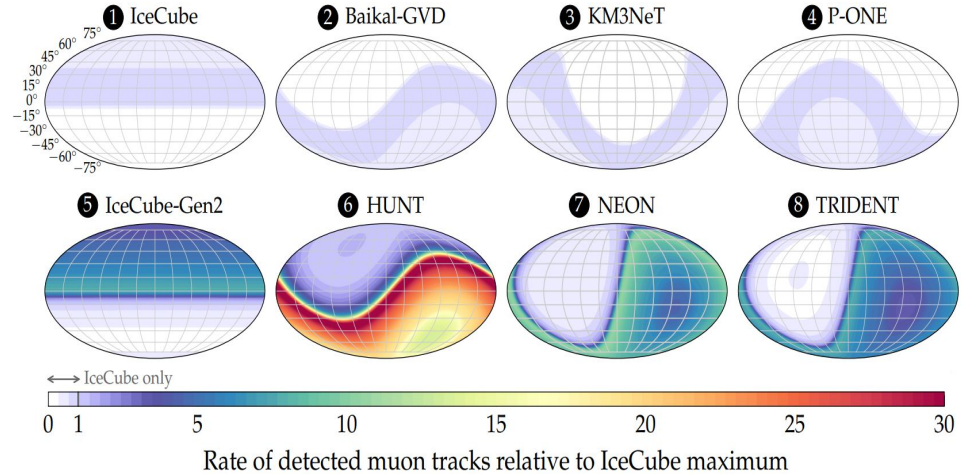
- particle physics:
 - ↳ **highest energy fixed-target** neutrino experiments (cross sections)
 - ↳ measurement of neutrino properties at the **highest accessible energies and cosmological baselines** (BSM physics will affect their production/propagation/detection in a variety of ways, see plot)
- particle astronomy and astrophysics:
 - ↳ characterisation of the **Milky Way's galactic centre** for its future usage as a **unique laboratory for particle and astrophysics**
 - ↳ **all-sky monitoring** of astrophysical neutrino sources (alerts)
 - ↳ **understanding of astrophysical sources** (multimessenger)
- cross disciplinarity:
 - ↳ oceanographic science (e.g., monitor temperatures and currents)
 - ↳ marine biology (e.g., study of bioluminescent organisms)



Comparison of physics goals with the current state of the art in the area



- state of the art is IceCube at the south pole:
 - ↳ detected two neutrino sources
 - ↳ detected neutrinos from the Milky Way's galactic plane
 - ↳ does not have the Milky Way's centre in its muon neutrino field of view
- towards a **planetary network of neutrino telescopes**
 - ↳ need to **increase number of telescopes** and **sky coverage** to observe multiple sources per year
 - ↳ need for different **specialised telescopes** to broaden our searches



Project's main advantages compared to competitor projects

- Does not rely on access to South Pole infrastructure (heavily oversubscribed)
- relies on **existing, world-leading oceanographic infrastructure** that minimises risks
- detector **deployment and maintenance delegated to specialised personal** and equipment
- more **scalable technological solutions** building on the experience of KM3NeT and GVD
- geometry optimised for ultra-high-energy neutrinos



Preferred location for the project

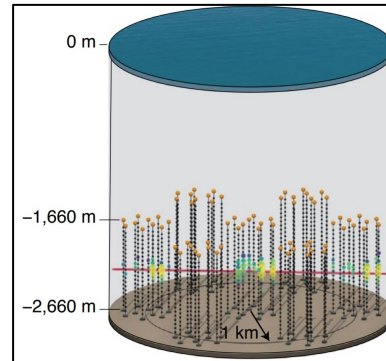
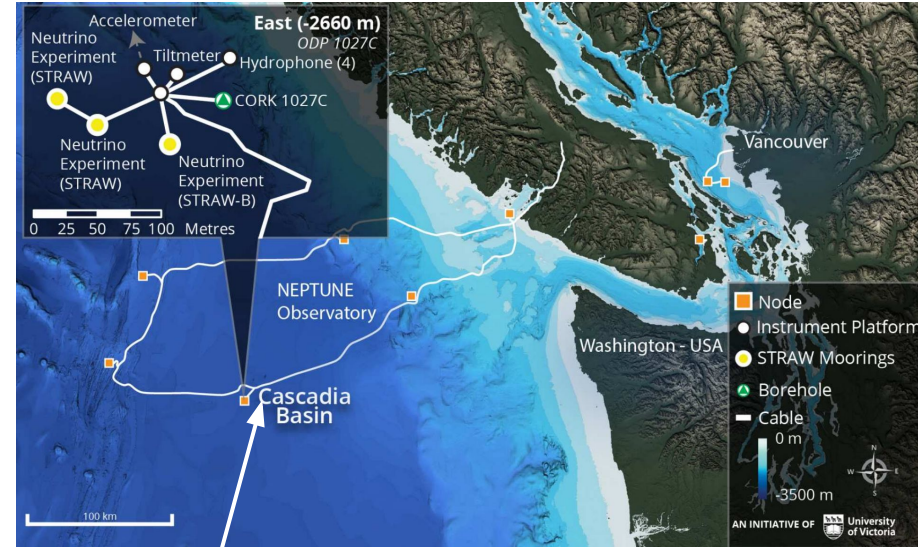
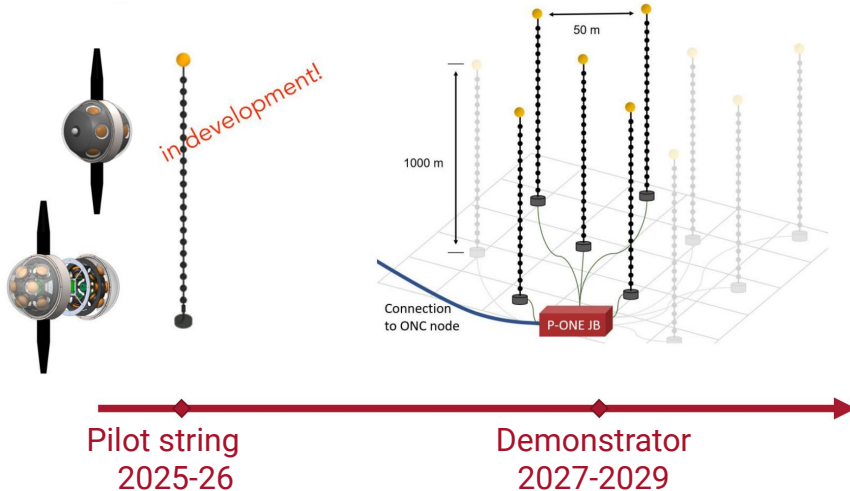
P-ONE will be hosted by Ocean Networks Canada (Vancouver)

Phased project timeline (if possible provide separate by the R&D, construction and exploitation periods)

- **Pilot** (first string): 2025-2026
- **Demonstrator** (first string cluster): 2027-2029
- **Full detector** (70-100 strings): 2030+

All phases include installation, commissioning and exploitation.

Exploitation will start already during detector construction



P-ONE full detector's beginning exploitation (next decade)

Main risks/obstacles for realisation of physics goals

- main risks identified is hardware long-term performance in marine environment (hostile conditions and biofouling)
- risks are strongly mitigated by gaining **early experience** and testing concepts with **pilot** and **demonstration phase**

Anticipated area(s) of UK involvement and financial, FTEs and financial costs

- P-ONE has become the **baseline experiment for the future of neutrino astronomy in the UK**
 - ↳ gives the UK a **leading role in one of most important particle and astrophysics experiments of next decade**, and the option to contribute to its design, development and exploitation
 - ↳ gives the UK the **opportunity to become a leading player** in the fast developing field of **multimessenger astronomy**, connecting STFC communities and enhancing cross disciplinary
- areas of UK involvement: trigger, module design and assembly, PMT and optical module characterisation, event reconstruction, monitoring and analysis tools
- **Demonstrator phase:** £1-2M over the next 5 yr to contribute to the **design, testing and exploitation of first string cluster**
- **Construction and Exploitation:** £10M to contribute to **~25% of the total project costs and lead its physics exploitation**

Environmental sustainability during construction and operation

- minimal environmental impact as P-ONE relies on existing infrastructure and deployment will rely on Ocean Network Canada's procedures and its commitments to environmental suitability
- carbon-neutral in operations; full carbon accounting and optimisation in preparation