



The Global Ocean Observing System



<https://airseaobs.org/>
SCOR #162

OCG-14 Hybrid Meeting
6-8 June 2023
Cape Town, South Africa

Uncrewed Surface Vehicle (USV) Observing Air-Sea Interactions Strategy (OASIS)

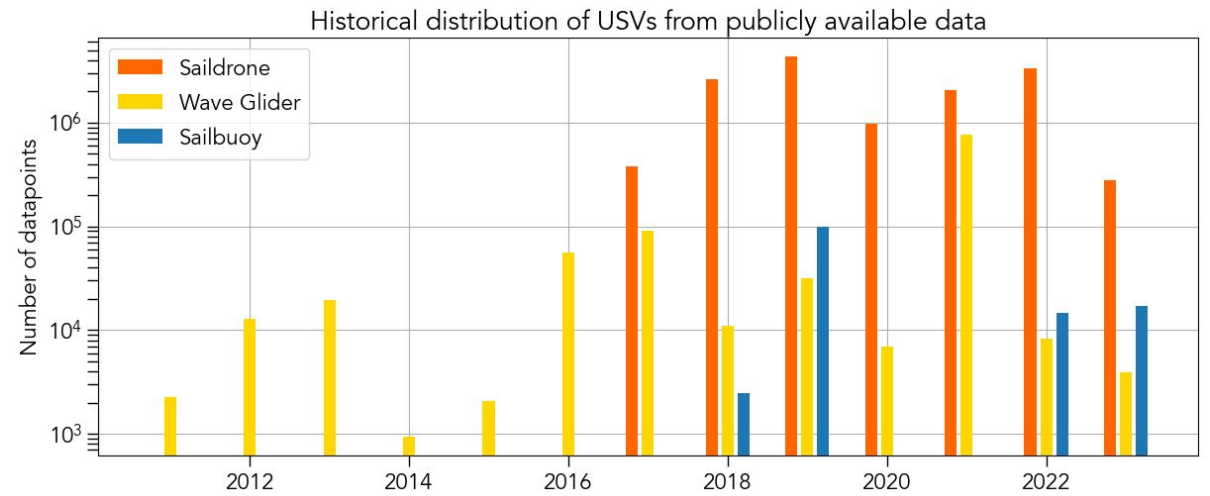
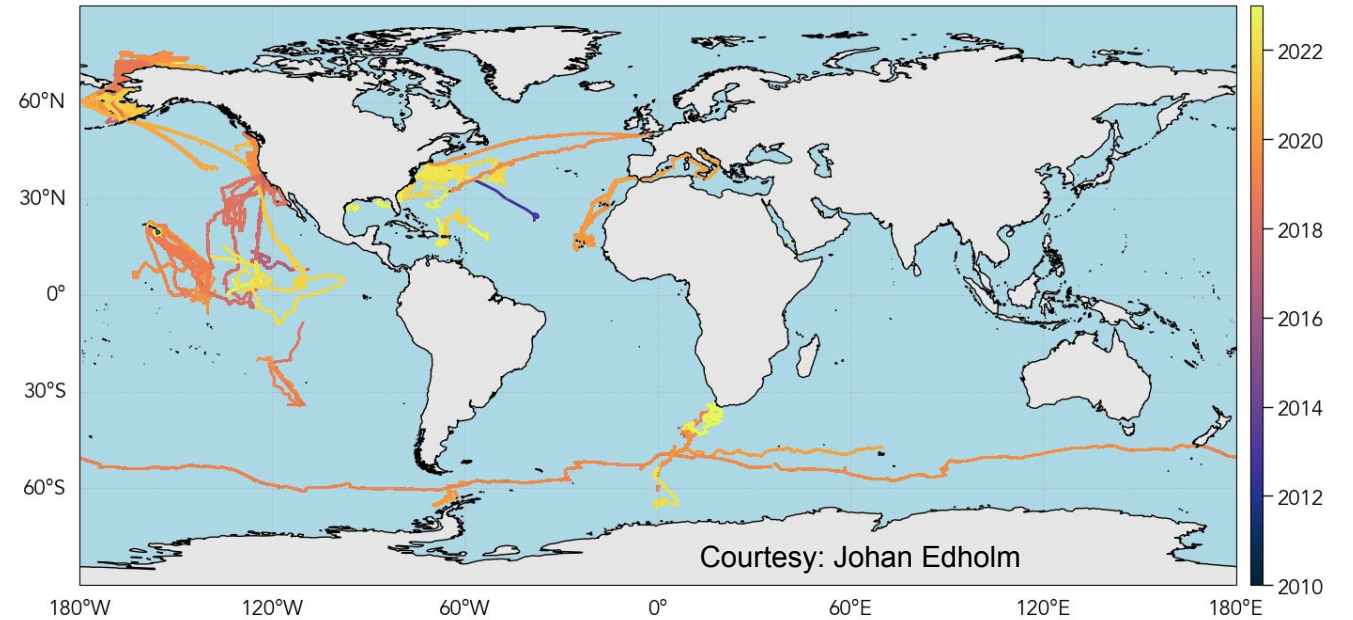
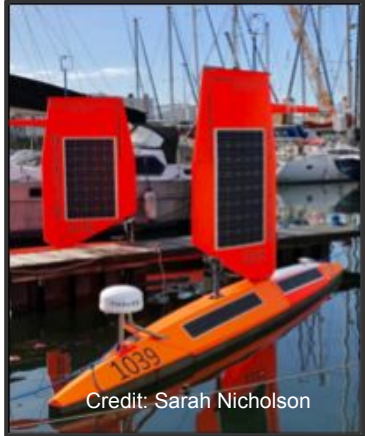
Sarah Nicholson* (South Africa)

Ruth Patterson* Meghan Cronin, Samantha Wills*, Johan Edholm*, Adrienne Sutton, Dongxiao Zhang, Laurent Grare, Tom Farrar, Greg Foltz, Jim Thomson, Eugene Burger, Jack Reeves Eyre*, Luc Lenain, Jaime Palter, Chidong Zhang, Andy Chiodi, Eric Lindstrom, Chris Meinig, Seb Swart, Marcel du Plessis*, Iwao Ueki, Akira Nagano, Pedro Monteiro, Carlos Barrera, Christoph Waldmann

*Early Career Ocean Professional (ECOP)



Network Overview



Developments and Achievements



- USVs Network for GOOS - Endorsed as UN project of OASIS UN Decade
- Developing a Community of Practice (CoP):
 - EuroSea ASV network workshops virtual in 2022 and in person at PLOCAN in 2023
 - OASIS Webinar series: A Community of Practice for USV
 - GROOM (EU Gliders) requiring coordination between gliders and USV networks
 - USV Network Workshop planned to follow OSM24
- USV Network Publications:
 - Uncrewed Surface Vessel Technological Diffusion Depends on Cross-Sectoral Investment in Open-Ocean Archetypes: A Systematic Review of USV Applications and Drivers (Patterson et al. 2022)
 - Public Private Partnerships to advance regional ocean observing capabilities: A Saildrone and NOAA-PMEL case study and future considerations to expand to global scale observing (Meinig et al. 2019)
 - Developing an Observing Air-Sea Interactions Strategy (OASIS) for the global ocean (Cronin et al. 2022)

Challenges and Concerns – *A network built on Public-Private-Partnerships*

Business – USV business models differ. Cannot have one size fits all for operations

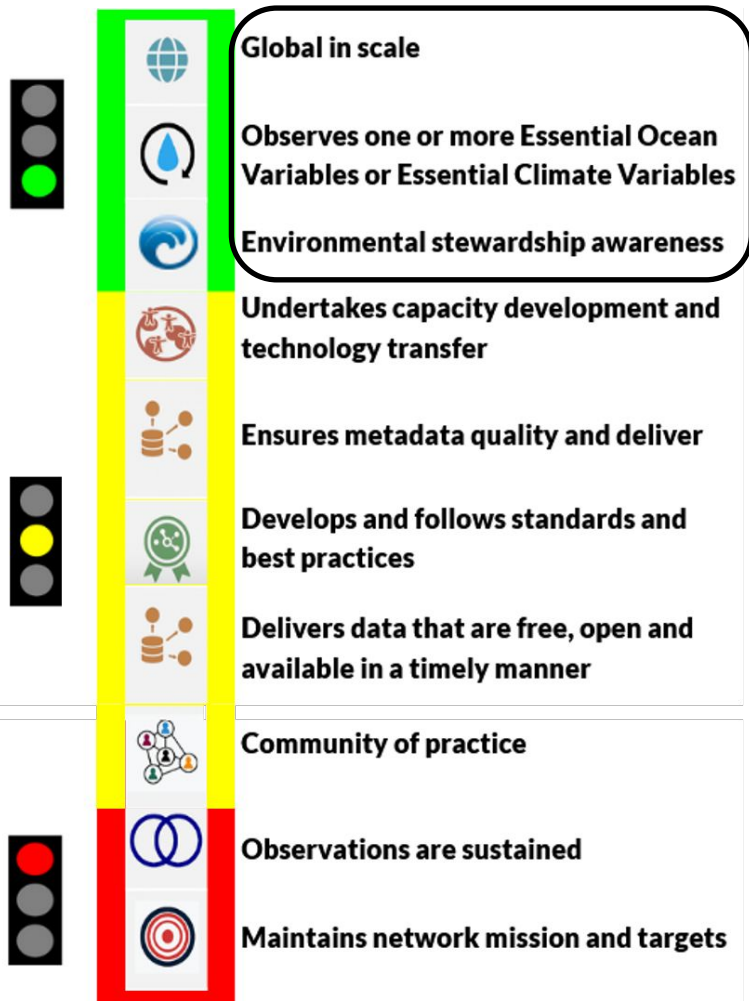
- Owner-operator
- Data-as-a-service

Scalability – limited by number of skilled individuals is challenge in science

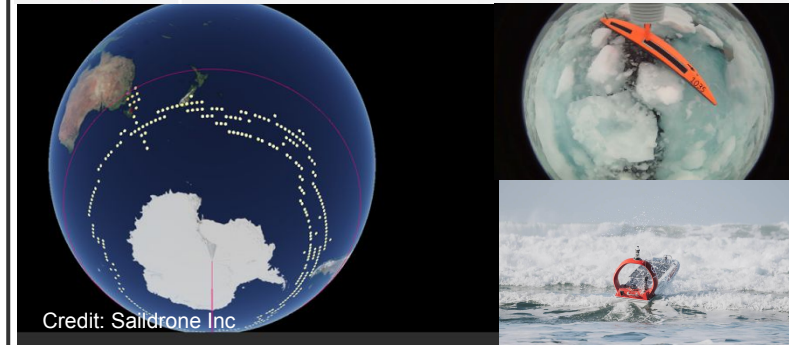
- USV technology innovations primarily for defense applications... not an open science culture.



Attribute Report out



Global in scale - Greater than regional, and as far as feasible, intention to be global.



Joined up with EuroSeas who have been developing network in Europe

EuroSea

Persistent, scalable, diverse, manoeuvrable



Observes one or more EOVS or ECVs - Contributes to meeting requirements through observing one or more of the GOOS Essential Ocean Variables or GCOS¹ Essential Climate Variables.

New capability for observing direct covariance wind stress for Saildrone (Reeves Eyre et al. 2023)

Multidisciplinary AIR and SEA instrument-based observations

Atmosphere	Land	Ocean
Surface <ul style="list-style-type: none"> Precipitation Pressure Radiation budget Temperature Water vapour Wind speed and direction Upper-air <ul style="list-style-type: none"> Earth radiation budget Lightning Temperature Water vapor Wind speed and direction Atmospheric Composition <ul style="list-style-type: none"> Aerosols Carbon dioxide, methane and other greenhouse gases Clouds Ozone Precursors for aerosols and ozone 	Hydrosphere <ul style="list-style-type: none"> Groundwater Lakes River discharge Cryosphere <ul style="list-style-type: none"> Glaciers Ice sheets and ice shelves Permafrost Snow Biosphere <ul style="list-style-type: none"> Above-ground biomass Albedo Evaporation from land Fire Fraction of absorbed photosynthetically active radiation (FAPAR) Land cover Land surface temperature Leaf area index Soil carbon Soil moisture 	Physical <ul style="list-style-type: none"> Ocean surface heat flux Sea ice Sea level Sea state Sea surface currents Sea surface salinity Sea surface stress Sea surface temperature Subsurface currents Subsurface salinity Subsurface temperature Biogeochemical <ul style="list-style-type: none"> Inorganic carbon Nitrous oxide Nutrients Ocean colour Oxygen Transient tracers Biological/ecosystems <ul style="list-style-type: none"> Marine habitats Plankton



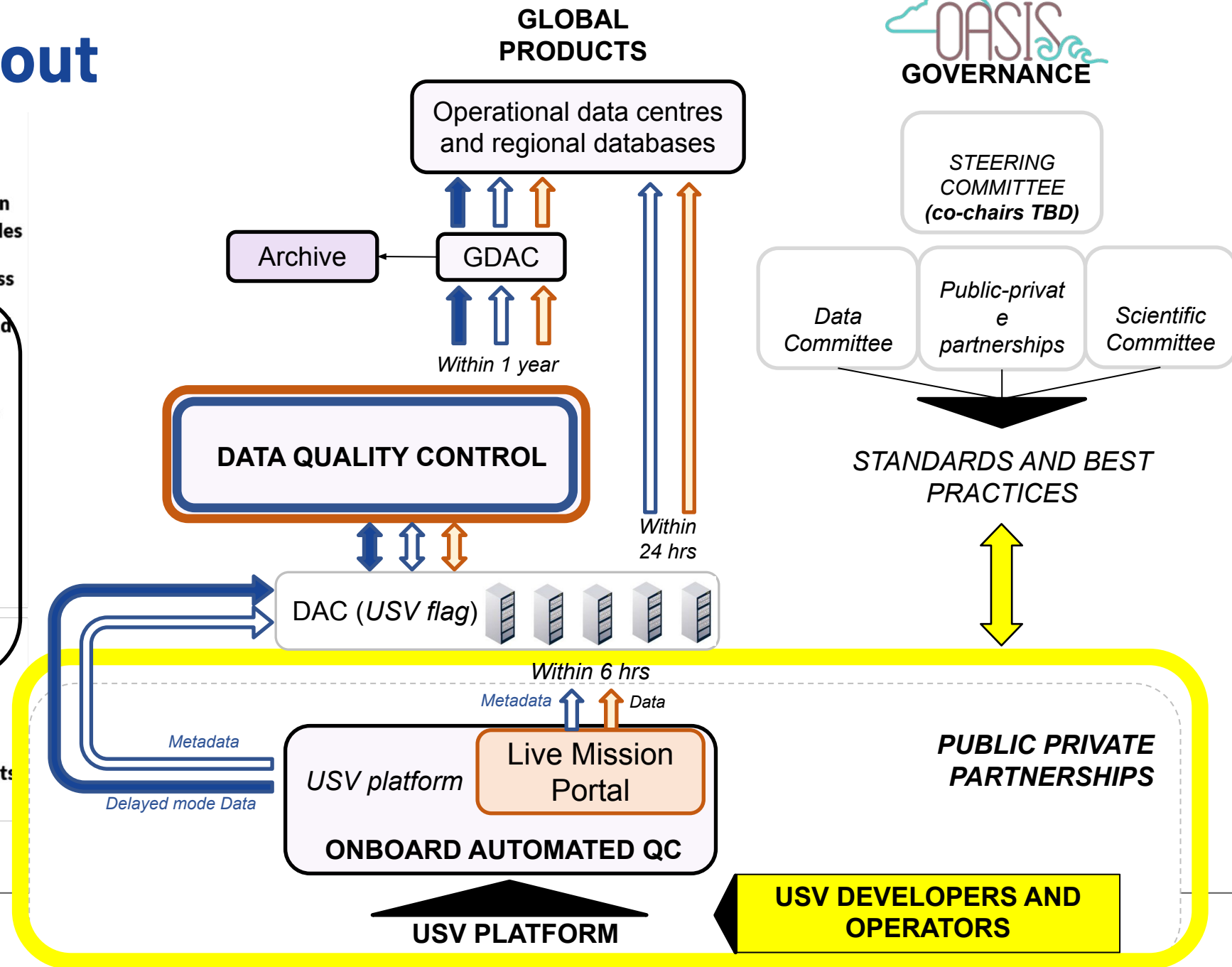
Environmental stewardship awareness - Actively develops ideas to minimize environmental footprint and contributes positively towards a healthy ocean.

- > Renewable energy sources
- > Non-expendable
- > Flexible and resilient

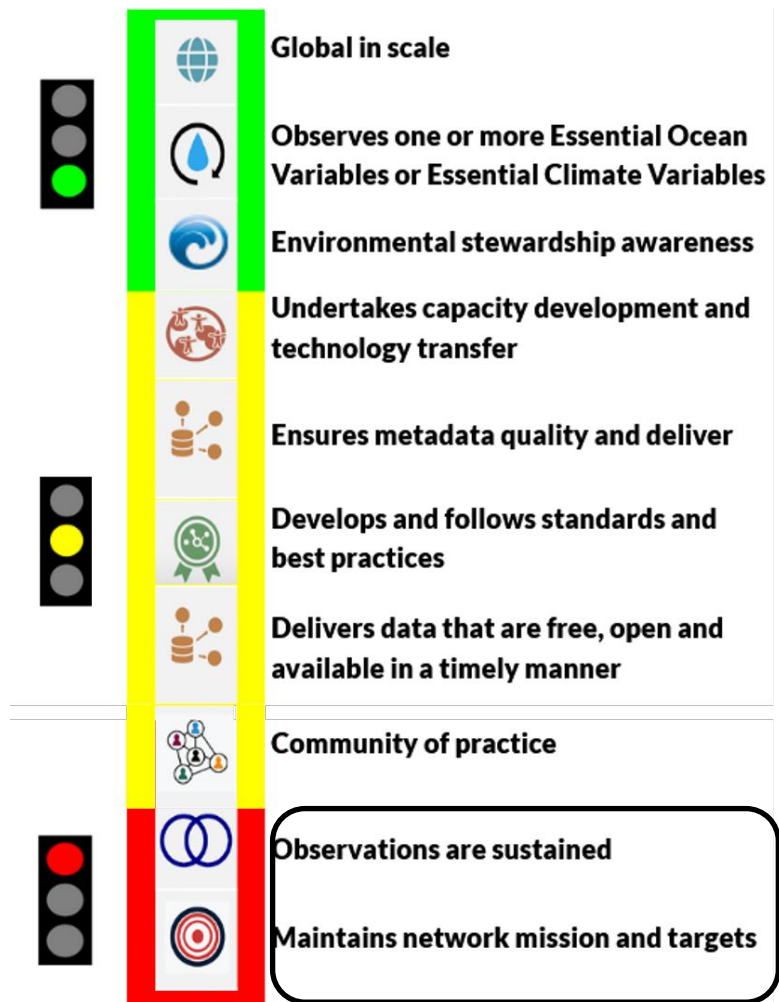
Intrinsically environmental



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Observations are sustained - Sustained over multiple years, beyond time-span of single research or experimental projects, undertaking routine, systematic and essential ocean observations

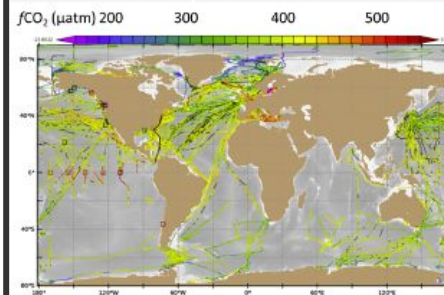
NOAA Surface Ocean CO₂ Monitoring network

Missions duration ~ 6 months;
Biofouling often the only limiting factor

Currently funded as single missions for research campaigns and pilot studies



Maintains network mission and targets - A role in the GOOS is defined and progress towards targets can be tracked and progress assessed.



Will be developed by proposed Community of Practice

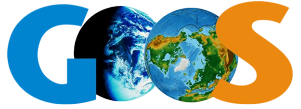
USV network for GOOS that will **FILL GAPS** in space, time, disciplines and complement existing GOOS infrastructure

Future Plans and Opportunities

- **Set up governance for community of Practice (CoP)** that includes **co-chairs, an executive committee, a science steering team, a data management team, and a data portal.**
 - Organize OSM24 Science Session & USV CoP Side Workshop
 - Need to develop a USV Network Website
 - National data portals need to be merged into a Global Network portal
- **Monthly USV Webinar Series** for developing the **CoP** for the USV Network for GOOS is building community – Contact Ruth Patterson
ruth.patterson@cdu.edu.au
<https://airseaobs.org/resources/webinars>

Asks from OCG

- Guidance on developing roadmap for 10 attributes of emerging network
- Support for a USV Network project office, including website
- High-level help & public forum formalizing rules and regulations for operating USVs. Maritime law for these vehicles is in infancy.
- Testbeds with reference data are needed for testing & validating USV innovations, including Private Industry USVs – Perhaps through collaboration with OceanSITES??



The Global Ocean Observing System

Thank you

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Intergovernmental
Oceanographic
Commission



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Hermann Luyt

