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# PORT CALL EXTRACTION AND CHARACTERISATION FROM MARITIME NAVIGATIONAL DATA: AN APPLICATION TO THE LESSER ANTILLES

CLÉMENT IPHAR<sup>1</sup>, IWAN LE BERRE<sup>1</sup>, ÉRIC FOULQUIER<sup>1</sup>, ALDO NAPOLI<sup>2</sup>

<sup>1</sup> LETG Laboratory – Littoral Environnement Télédétection Géomatique UMR 6554, Brest University, IUEM, Plouzané, France

<sup>2</sup> CRC – Centre for Research on Risks and Crises, MinesParis – PSL, Sophia Antipolis, France

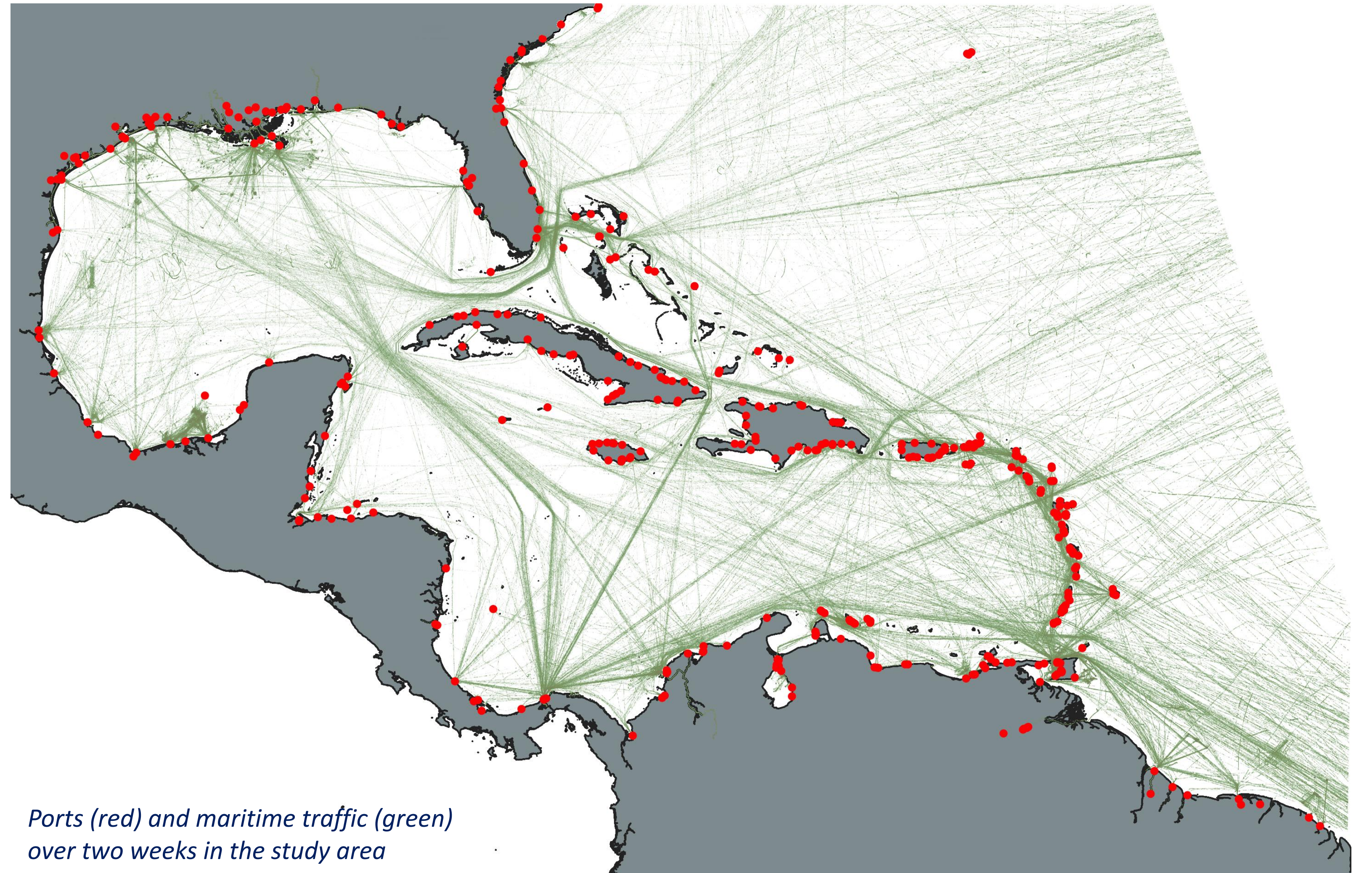
## CONTEXT

- Our work focuses on **maritime transport characterisation** and its impact in the **Caribbean**, a region fragmented into multiple territories and different sovereignties owing to major administrative and regulatory discrepancies.
- We aim at assessing **port vulnerability** through **port traffic data** extracted from vessel positions, and analysed through the prism of the **port call**.

## DATA

This analysis is based on the joint use of AIS data and a mapping of the ports of the study area.

- The **AIS dataset** has been acquired from the company exactEarth for the Caribbean and the Gulf of Mexico for the full year 2019 (TRAFIC project, funded by the Fondation de France). This dataset contains about 642M messages, *i.e.* 1.76M per day.
- The **port mapping** has been interpreted using **satellite imagery** (Google Earth, Bing) with QGIS. The commercial berths (quays and wharves) of 387 ports have been meticulously surveyed at the 1/5000 scale. In the Lesser Antilles, a total of 101 ports and 296 port structures has been identified.

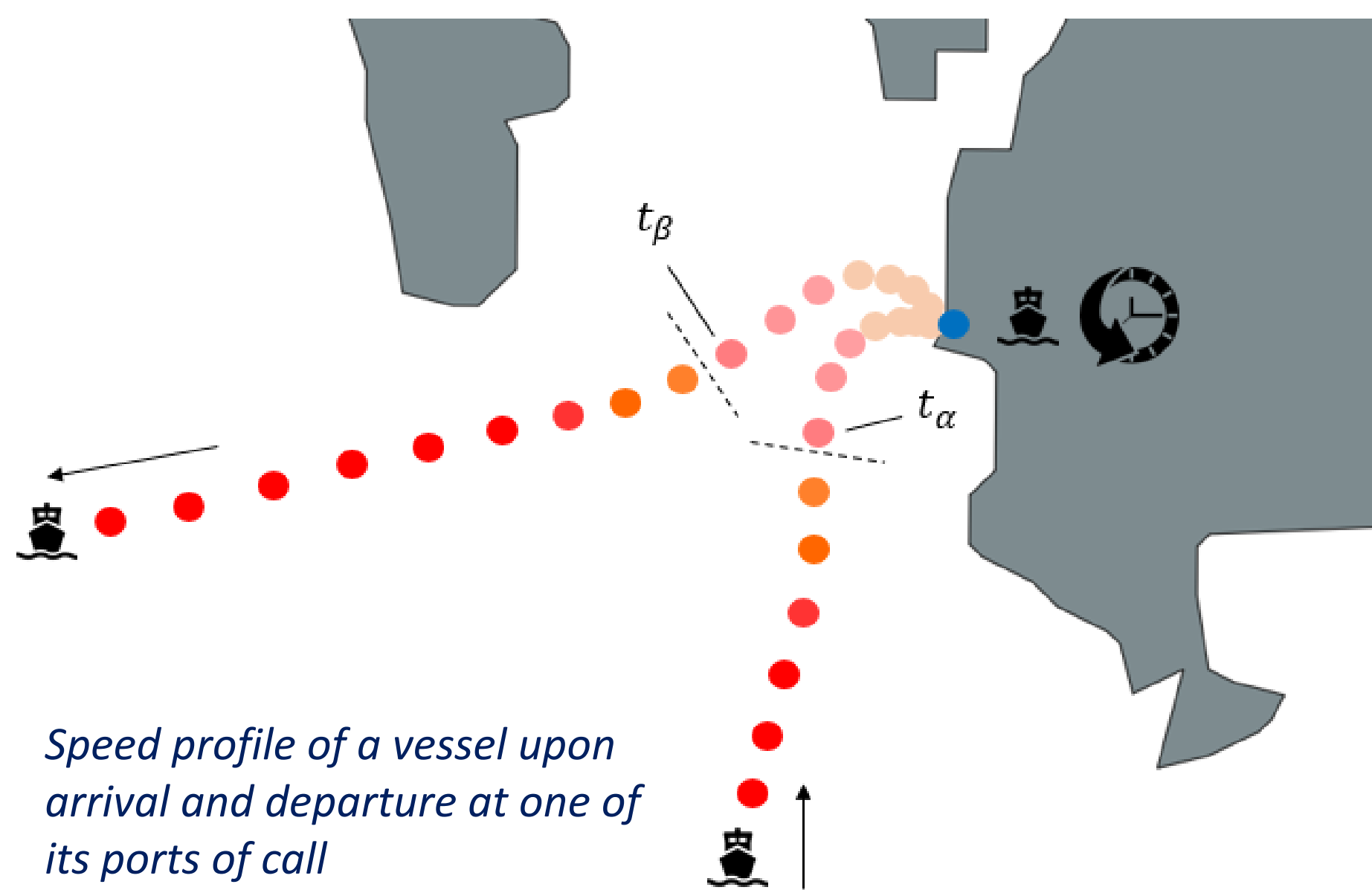


Ports (red) and maritime traffic (green) over two weeks in the study area

## PORT CALL ANALYSIS

### Extraction

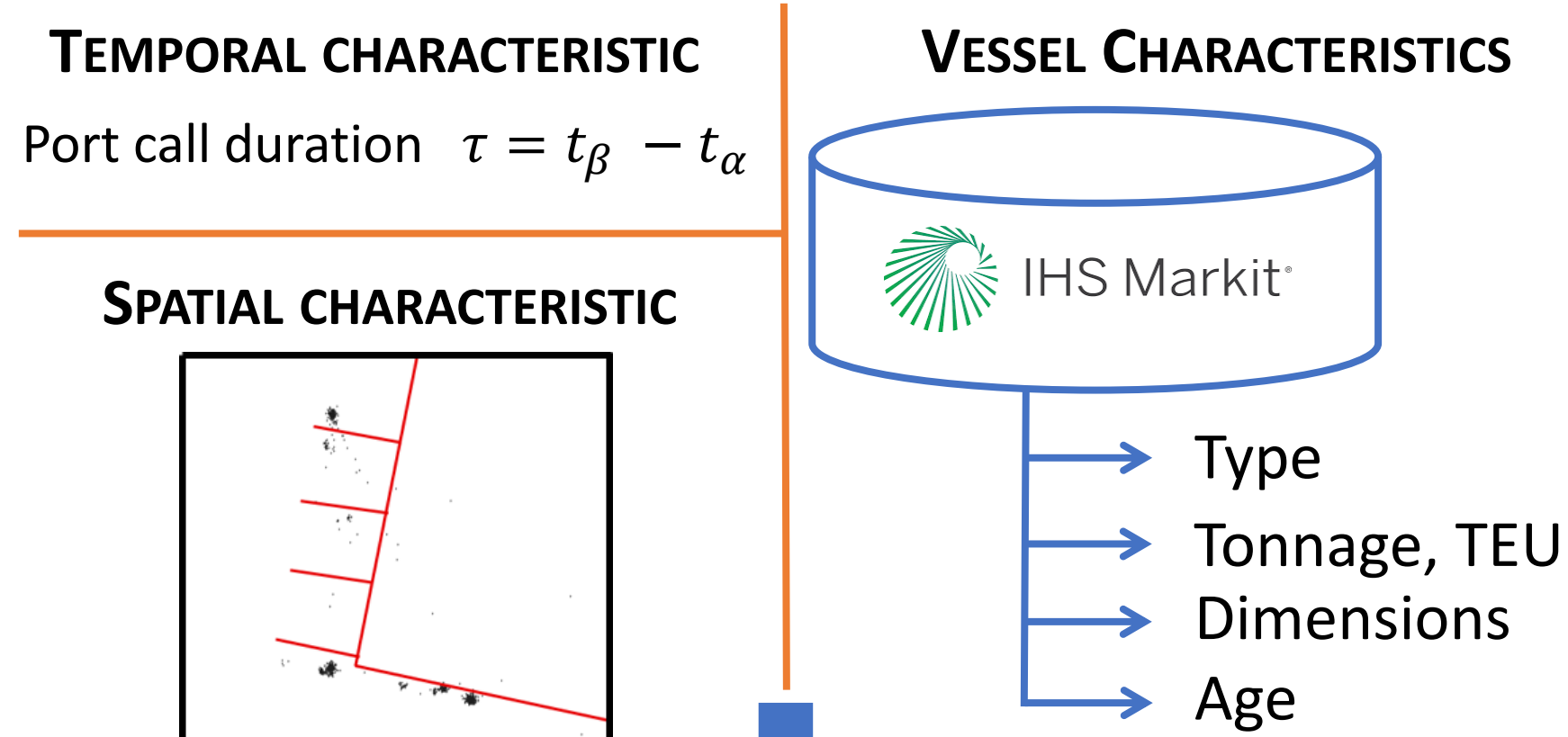
Arrivals and departures (day and hour) are timestamped at the crossing of a **speed threshold of 0.5 knots** in the vicinity of a port infrastructure.



Speed profile of a vessel upon arrival and departure at one of its ports of call

### Characterisation

**Spatial and temporal characteristics** of the port call are computed from AIS data. They are completed by **vessel characteristics** extracted from a database maintained by the IHS Markit firm.

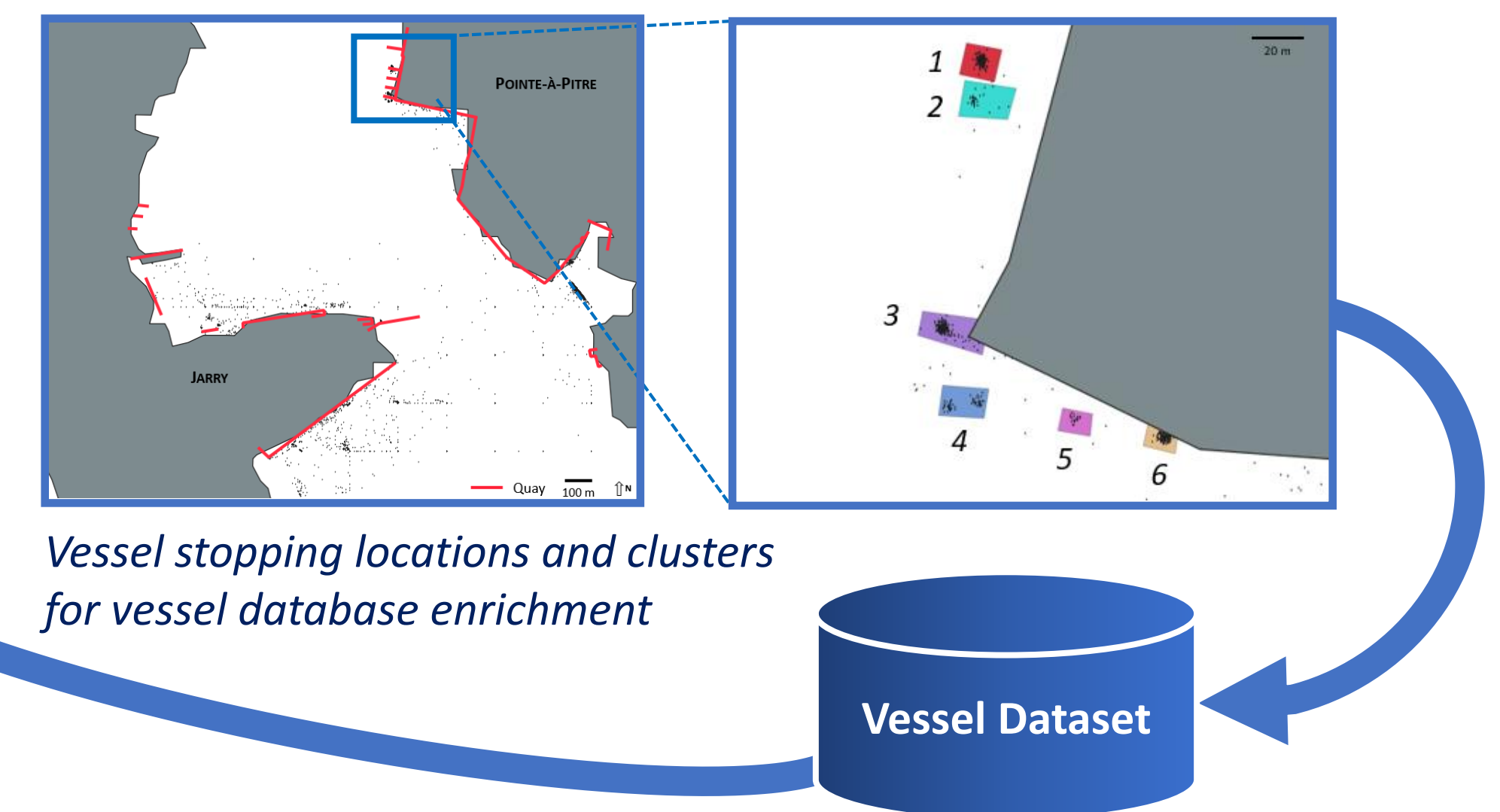


Generation of a **database of port calls**

- 1 455 000 port calls in the whole of the Caribbean area in 2019
- 171 000 port calls in the 101 surveyed ports of the Lesser Antilles

### Enrichment

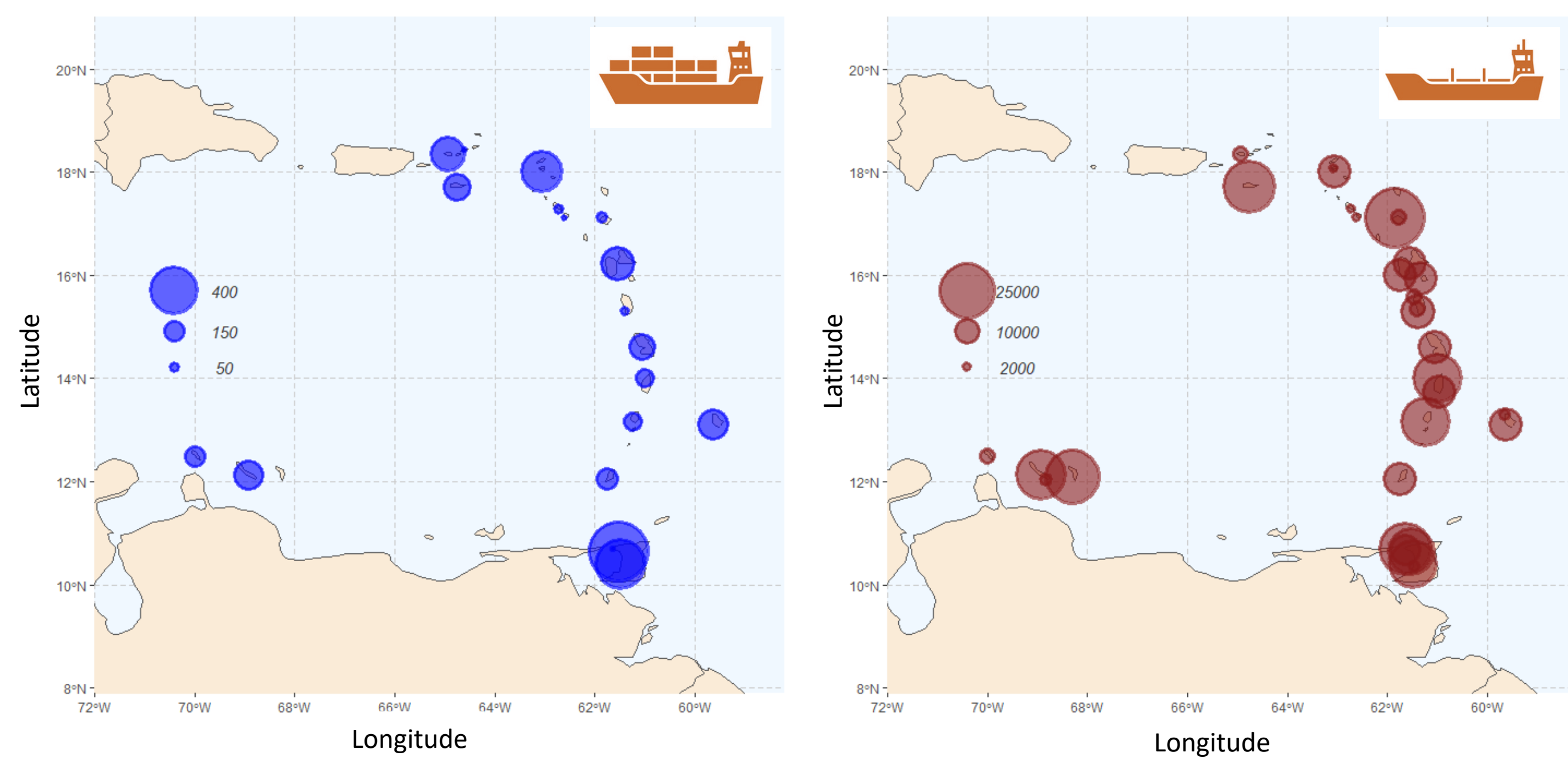
The vessel database is enhanced through a method of enrichment which aims at retrieving vessels that are not described in IHS Markit's data by using the clusters of precise vessel stopping location, and considering that similar vessels tend to stop at the same berth.



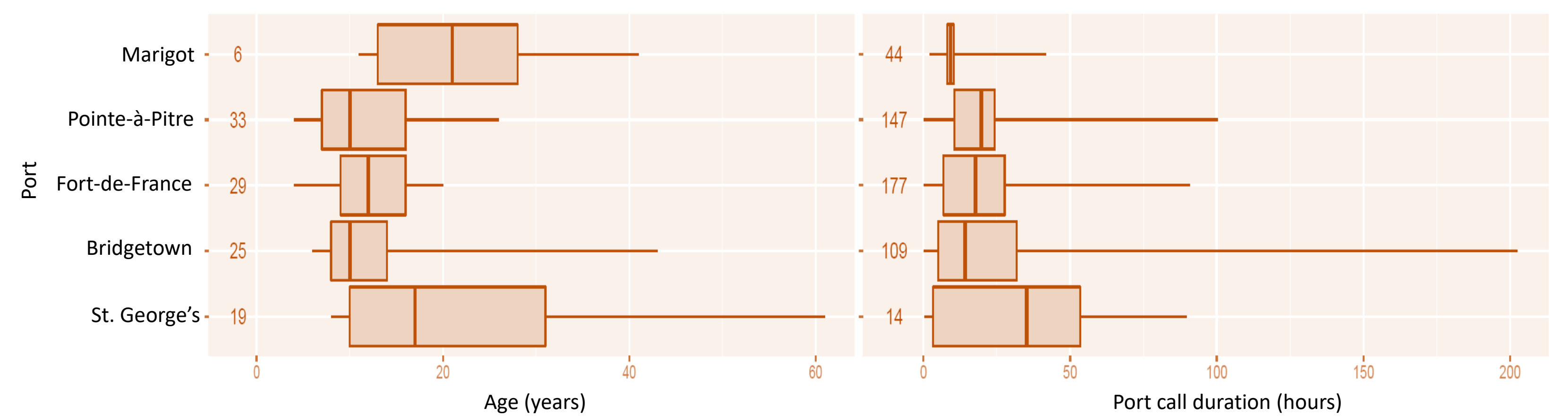
Vessel stopping locations and clusters for vessel database enrichment

## RESULTS

- Values are given for each port, for each vessel type and along various parameters: age or vessel tonnage, port call duration or total number of calls.
- They are validated in **comparison with a UNCTAD database** (article in progress)



Number of port calls for container vessels (left) and mean tonnage of bulk vessels (right)



Age of general cargo vessels and port call duration of tanker vessels for 5 ports of the Lesser Antilles

## UPCOMING WORK...

- Determination of **inter-ports journeys**, and of **vessel trajectories** in the Caribbean
- Characterisation of networks** and subnetworks between ports, according to vessel types and port calls characteristics
- Development of a **geovisualisation dashboard** of port calls and related indicators, enabling the assessment of port activity, traffic pressure applied on ports and port vulnerabilities.

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