POST-HARVEST INNOVATION PROGRAMME

a public-private partnership between

science & technology Department: Science and Technology REPUBLIC OF SOUTH AFRICA

fpef SOUTH AFRICA Fresh Produce Exporters' Forum

Good Cold Chain Practice

Dr Esbeth van Dyk

CSIR Built Environment – Transport & Freight Logistics

Ms L Haasbroek, Dr L Goedhals-Gerber, Prof M Dodd, Mr H Freiboth

Stellenbosch University – Departments of Logistics & Horticulture

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Background on Good Cold Chain Practice study

- Concern in fruit industry that large amount of fruit and money is lost every season due to breaks in the cold chain
- Aim of study:
  - to determine possible causes of breaks in the cold chain from pack house to vessel
  - to develop Good Cold Chain Practice guide
- Study was funded by Post-Harvest Innovation fund with co-funding from CSIR and SU.

Importance of temperature

- Temperature is the largest determinant of fresh produce deterioration rates and potential shelf life, e.g.

  Grapes deteriorate more in 1 hour at 32°C than during 1 day at 4°C or a full week at 0°C (Thompson *et al*, 2008)
- Humidity also extremely important
- The higher the temperature, the higher the risk of quality problems
- The effect of breaks are additive

Understanding temperature breaks

- Focused on fruit exported in reefer containers
- Focused on fruit that is sensitive to temperature:
  - grapes, summer pears and plums
- Made observations at farms, pack houses, cold stores and Cape Town Container Terminal
- Analysed historic temperature data
- Conducted temperature trials

Observations

Observations on farms

- Fruit picked in high temperatures during middle of the day
- Picked fruit waiting for long time in high temperatures to be transported to pack house

Observations at pack houses

- Fruit received outside in shade
- High temperatures inside pack house
- Fruit too warm when packed

Observations at cold stores

- Airlock loading bays usually not available so fruit stand outside under roof in high temperatures while waiting to be loaded into container

Observations at port

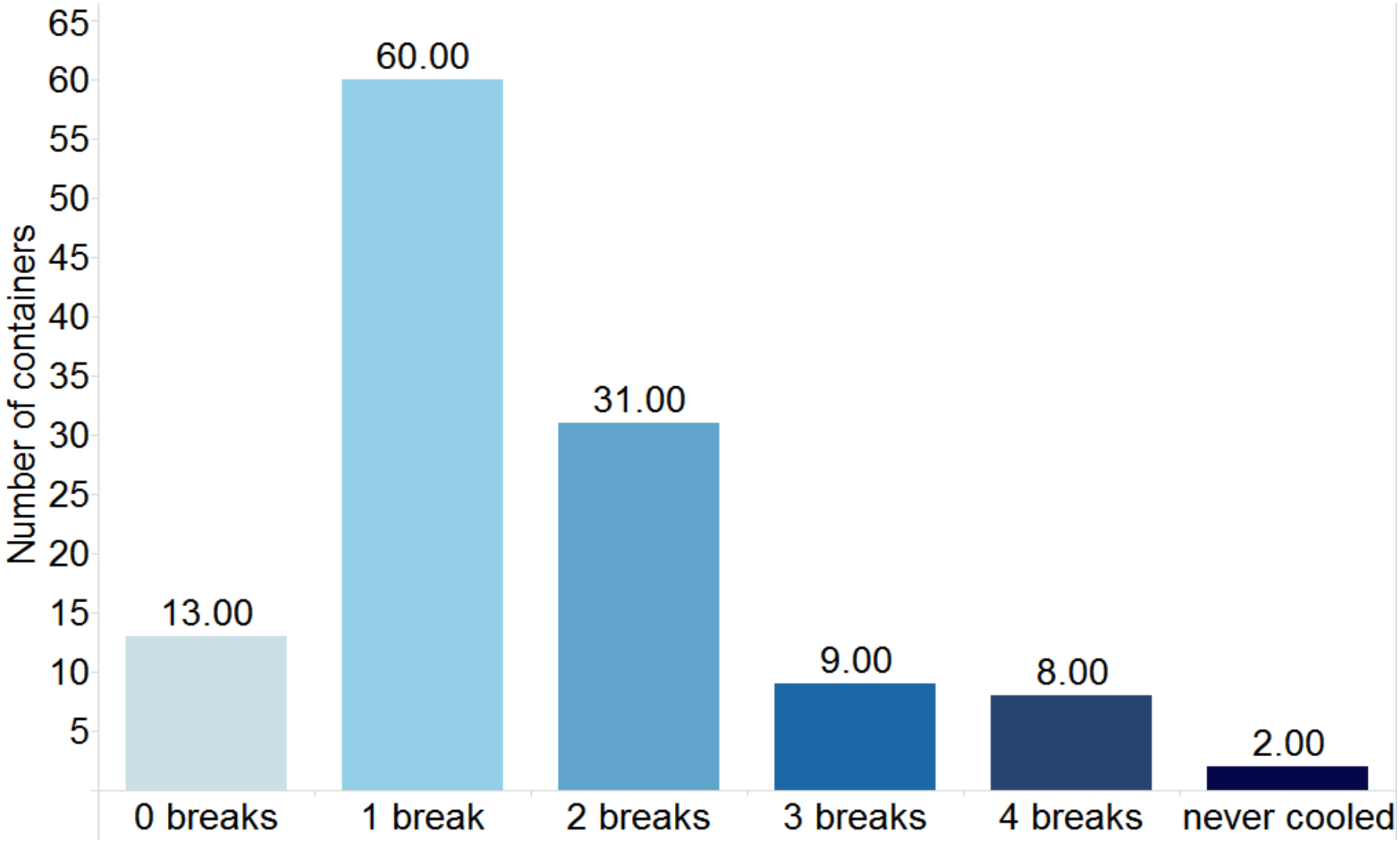
- Both reefer stacks now fitted with Refcon container monitoring system, but not all containers /vessels fitted with modems
- Long queues of trucks waiting to enter port – containers from cold stores that are less than 2 hours travel time from port do not have gensets

Analysis of temperature data

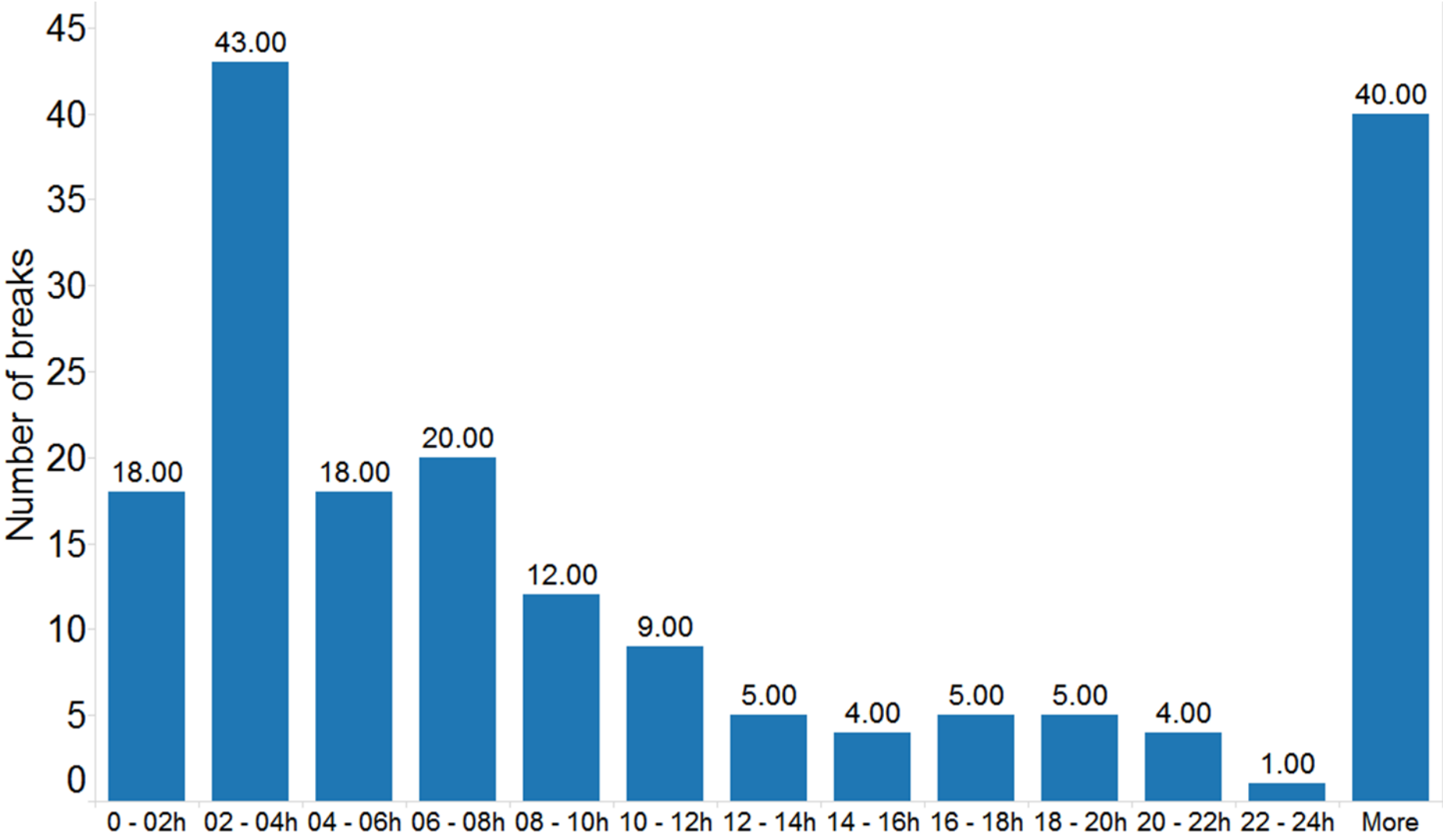
Analysis of historic temperature data

- Commodities included in the study: apples, pears, plums and grapes
- Export supply chain: fruit exported from the Port of Cape Town to Europe and the United Kingdom
- Define a break in the cold chain as any rise in ambient temperature above 2°C, for longer than 90 minutes
- Data analysed for 123 containers from 2012/13 season
- 183 breaks were identified

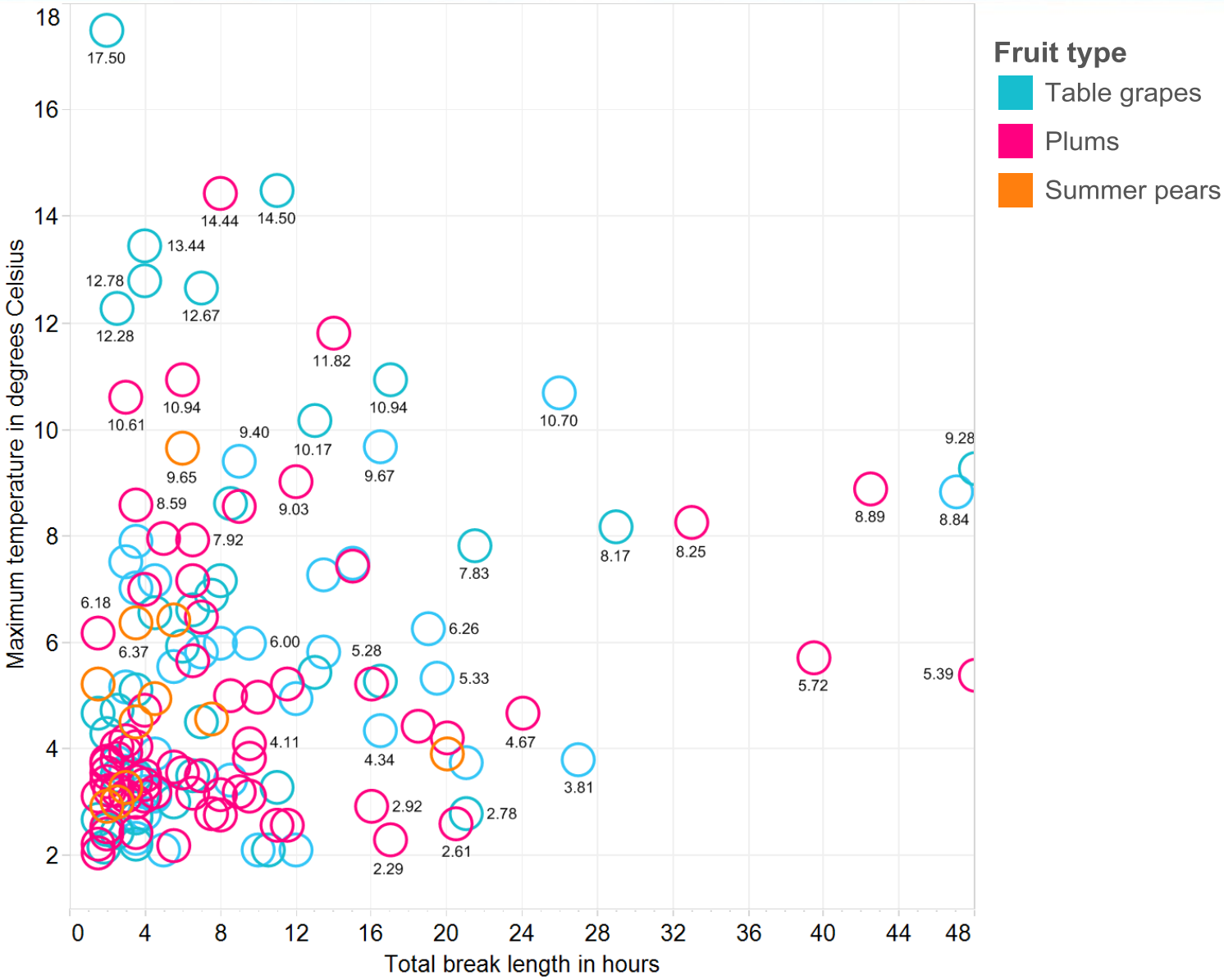
Total number of breaks per container



Length of breaks in hours



Severity of the breaks shorter than 2 days



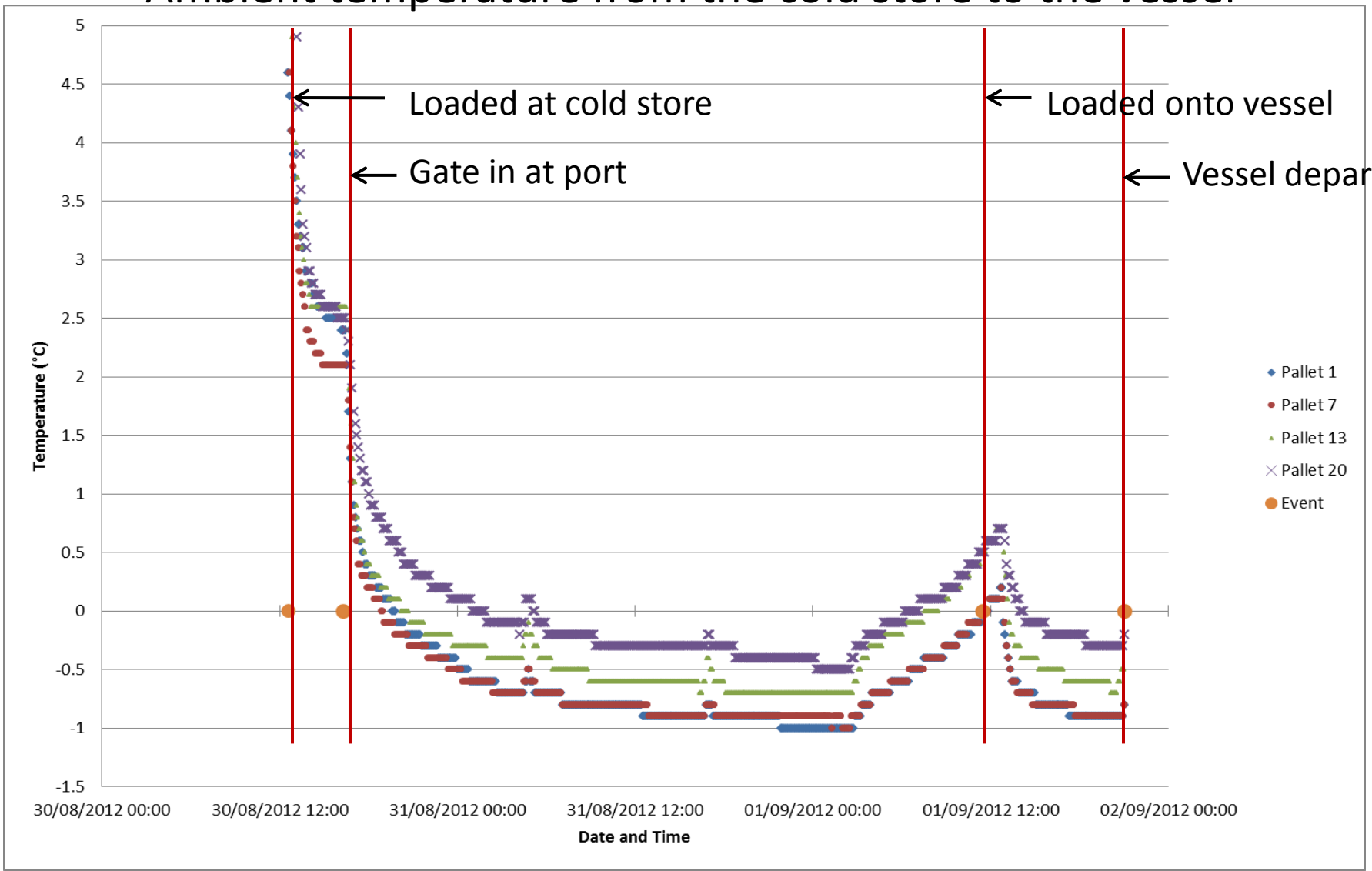
Summary of temperature breaks

	Cold store	Truck	Reefer stack	Load vessel
No of breaks originating	23	84	60	16
No of breaks continuing to next segment	18	77	33	
Duration of break	1:30 – 24 days	1:30 – 20 days	1:30 – 16 days	1:30 – 17 days
Origin of breaks of longer than 1 day	7	21	8	2
Max temp	2.8°C – 13.4°C	2.8°C – 26.6°C	2.1°C – 19.7°C	2.1°C – 13.81°C

Trials

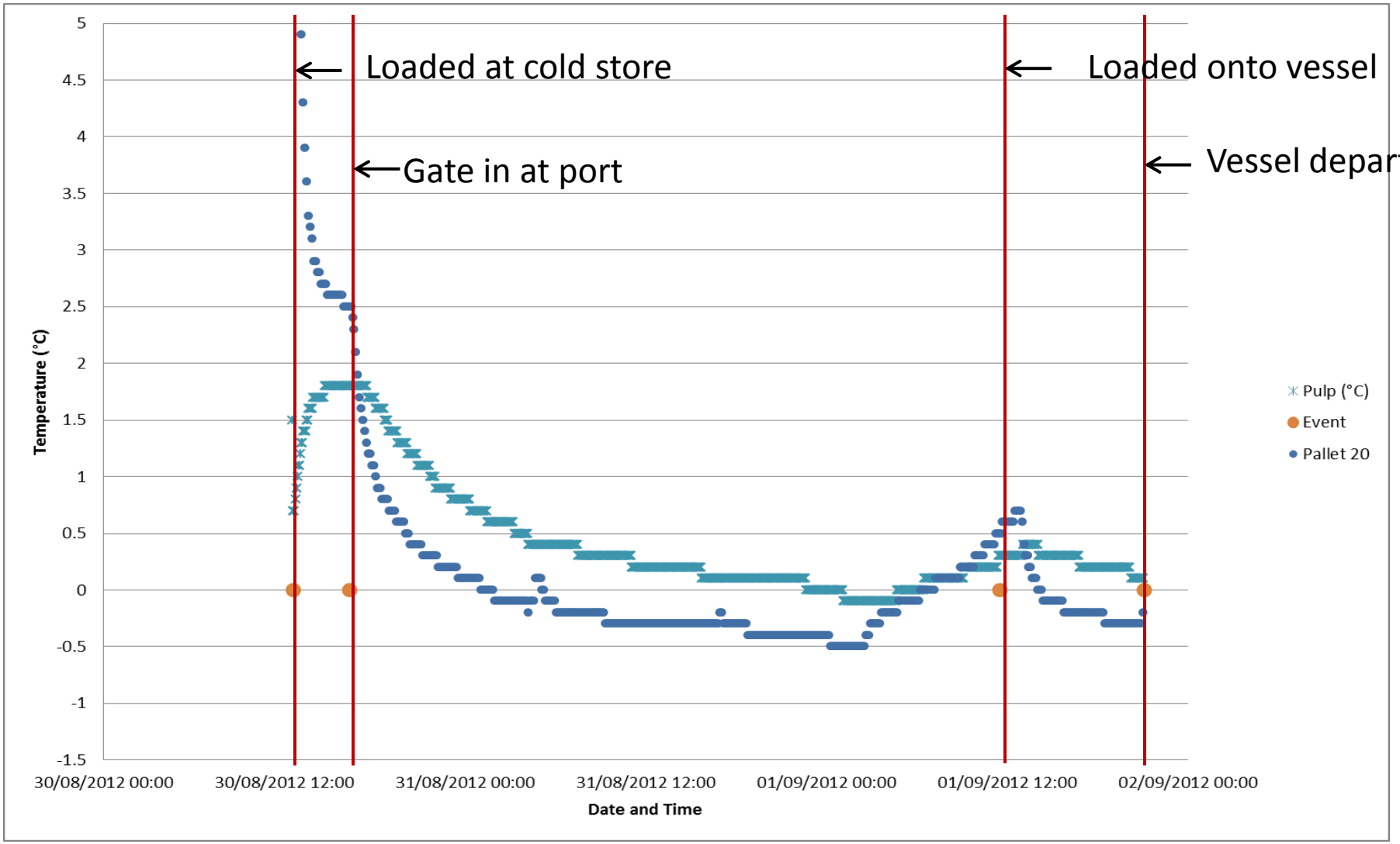
Trial data: apples from Ceres (1)

Ambient temperature from the cold store to the vessel

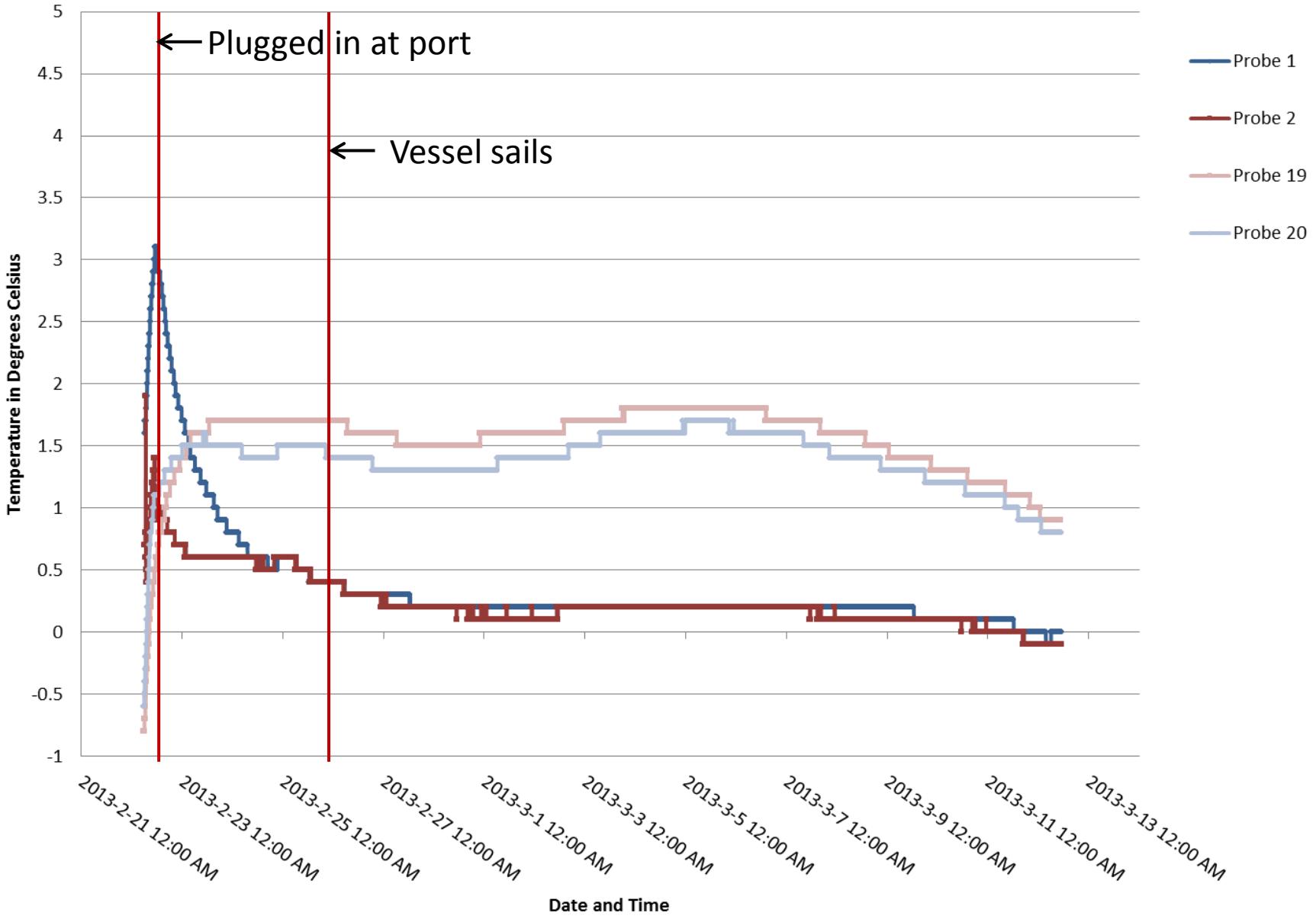


Trial data: apples from Ceres (2)

Ambient temperature versus fruit pulp temperature



Trial data: grapes from Hex River



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Pack house

Pack houses with roofs that are not insulated cause high room temperatures.

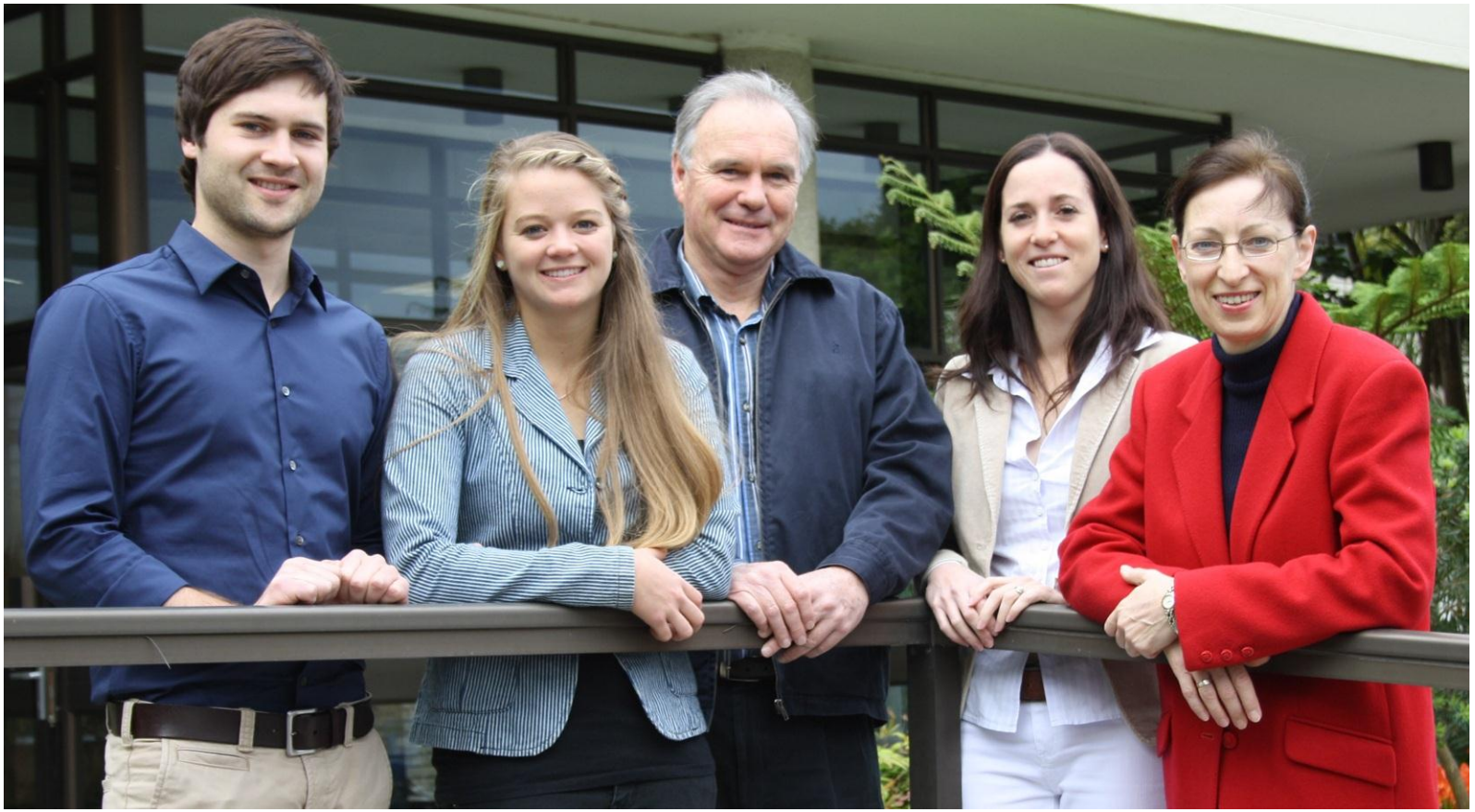
Pack houses with insulated roofs help keep the room temperatures low.

Loading of container

Loading of pallets mostly happens outside in warm temperatures.

Making use of airlock loading bays is the ideal.

Thank you



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