

# Stewart Island Energy Futures Workshop

Wind Energy Scoping

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# Introduction

- Wind prospecting
- Wind flow modelling
- Data from August 2010 Report
- Next step – Wind flow modelling
- Wind monitoring
  - What is it?
  - What is the importance?

# August 2010 Report

There is both evidentially and anecdotally, a wind resource at Stewart Island that intuitively can be exploited.

How did I get to this?

- Flagged trees at several locations
- Discussions with residents
- Good data from regional meteorological stations – Invercargill Airport and Tiwai point
- Some potential locations of interest within the Oban area

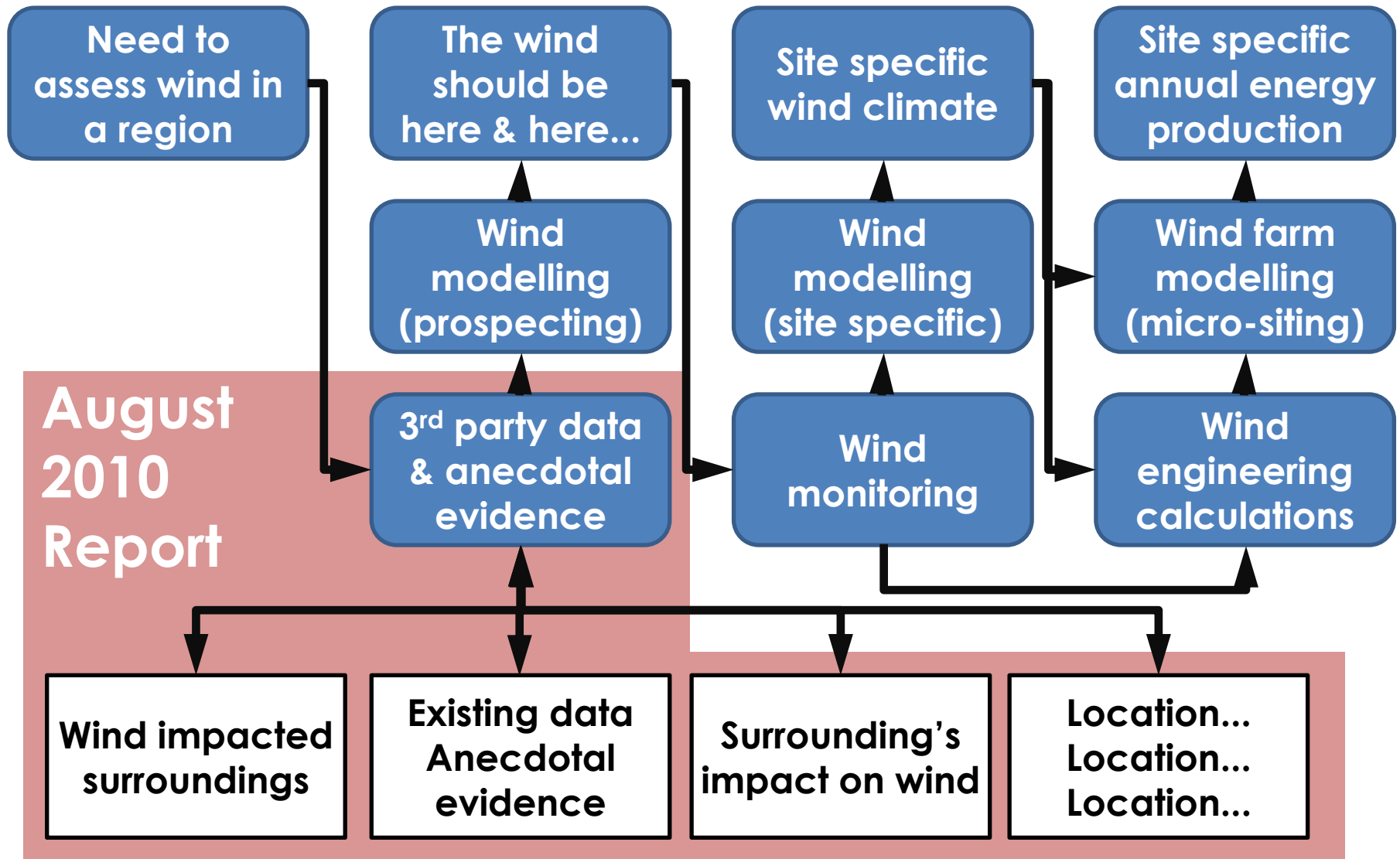
What now? How do you figure the actual potential of wind energy for Stewart Island?

# To figure the potential...

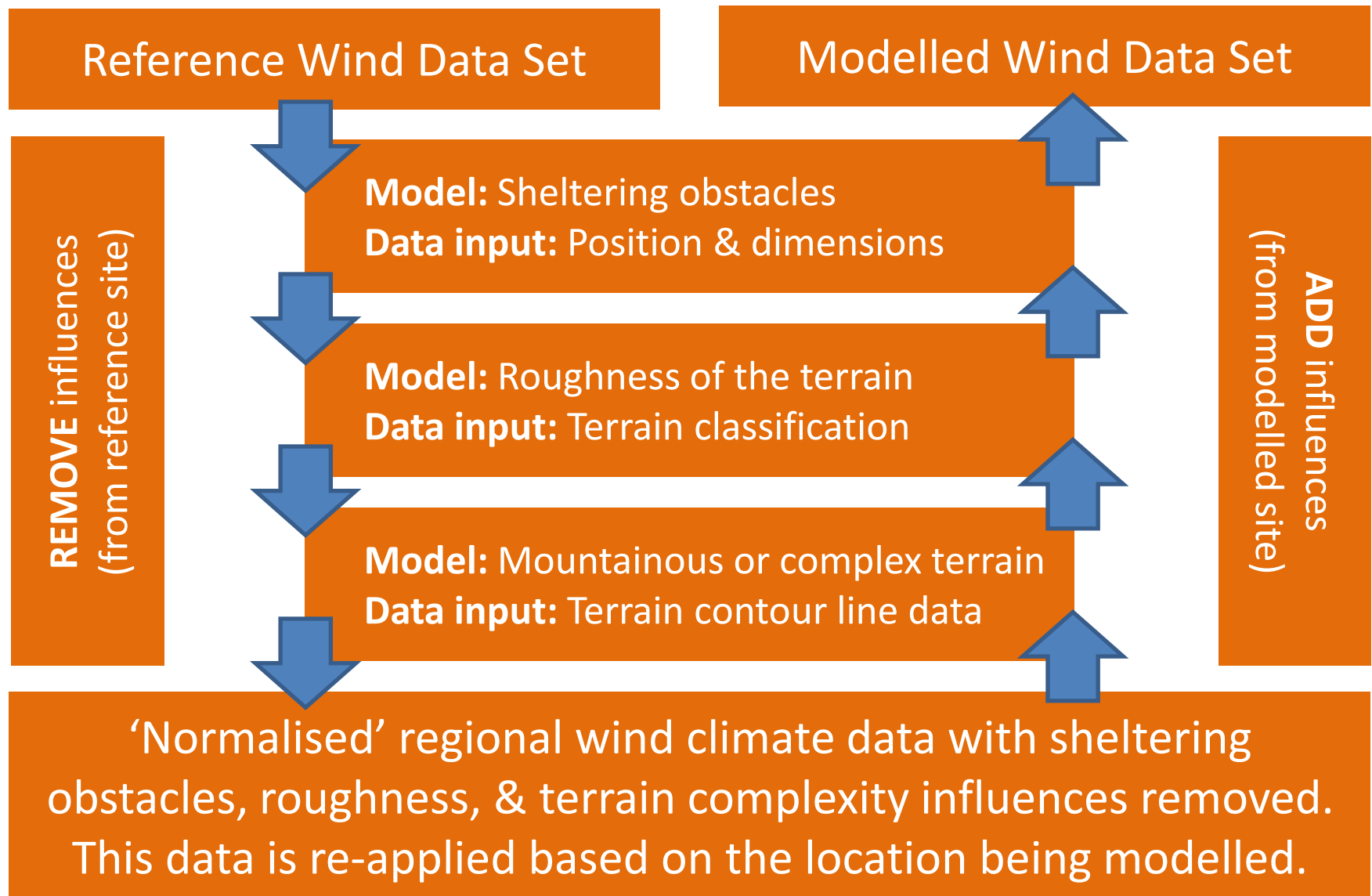
...you need to know the wind climate...

- Wind prospecting
  - Identify potential sites via wind flow modelling using regional wind data
  - Establish monitoring site choice by wind model results, access, terrain, existing land use, land ownership, environmental considerations, location to network etc...
- Wind Monitoring
  - Establish what wind there is at a site and what you can make of it!

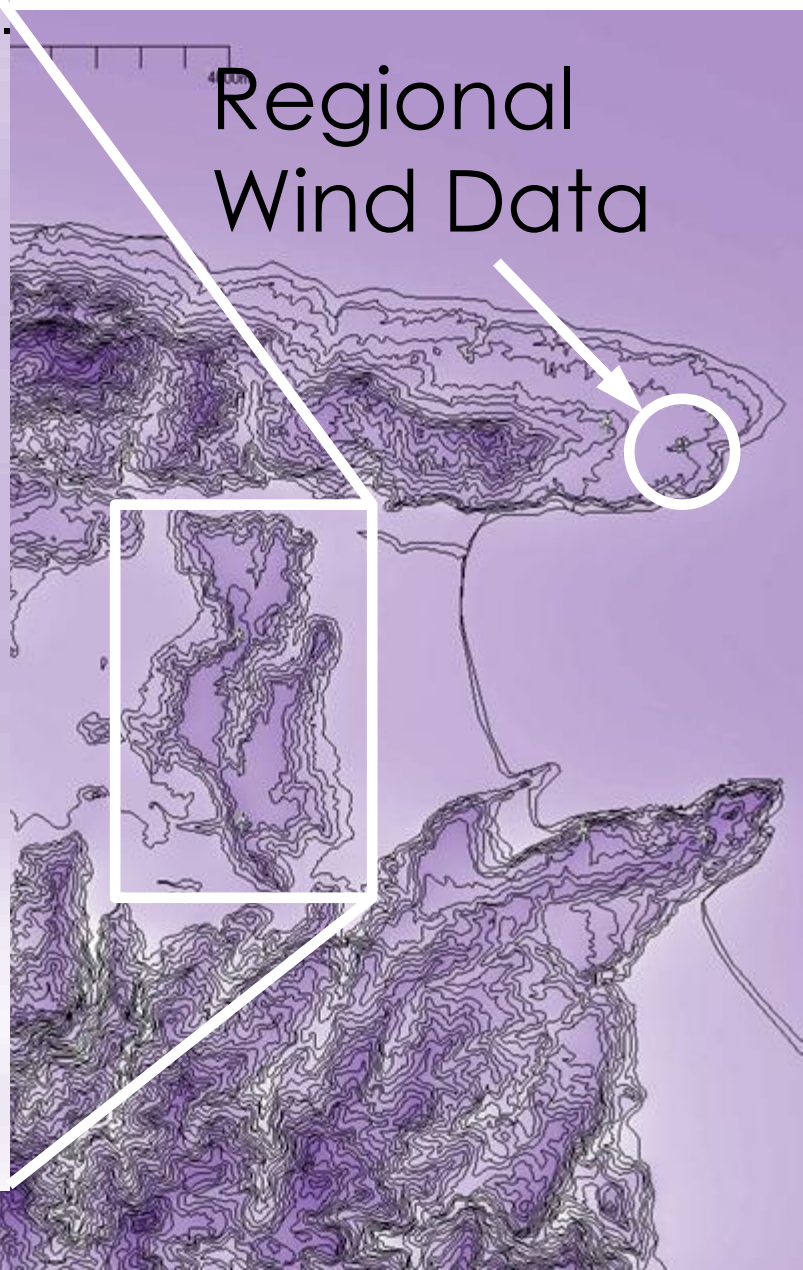
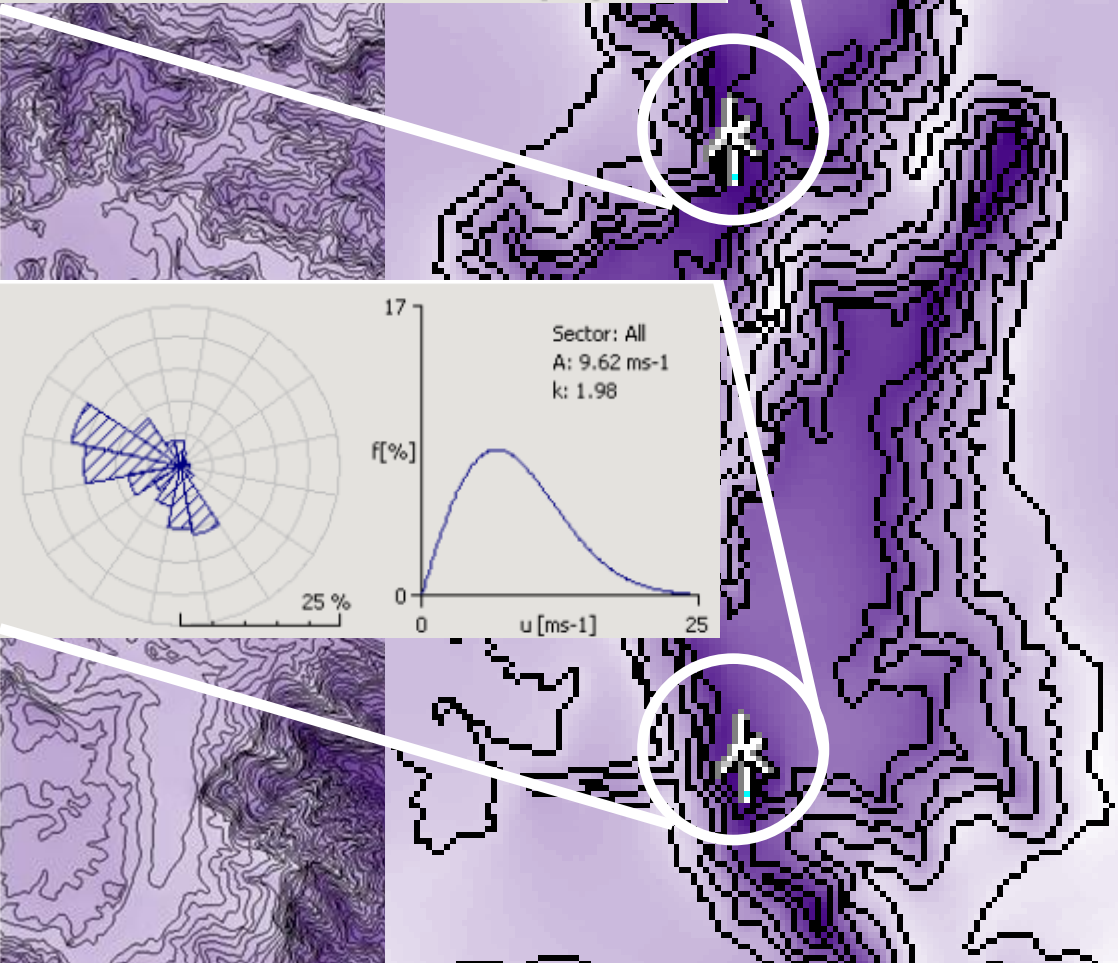
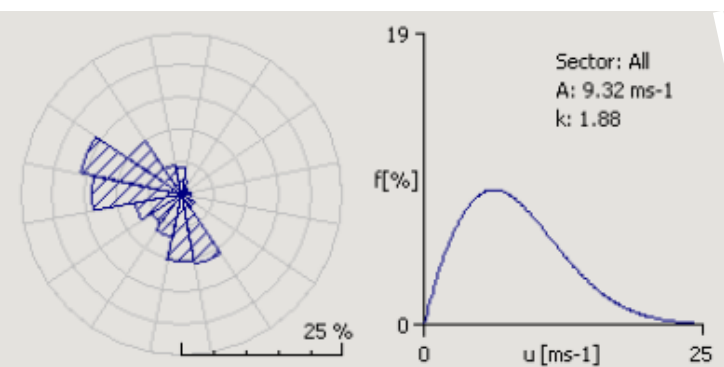
# Typical Wind Prospect Stages



# Wind Prospecting with WAsP







# Regional Wind Data

So, what does the regional wind resource look like?

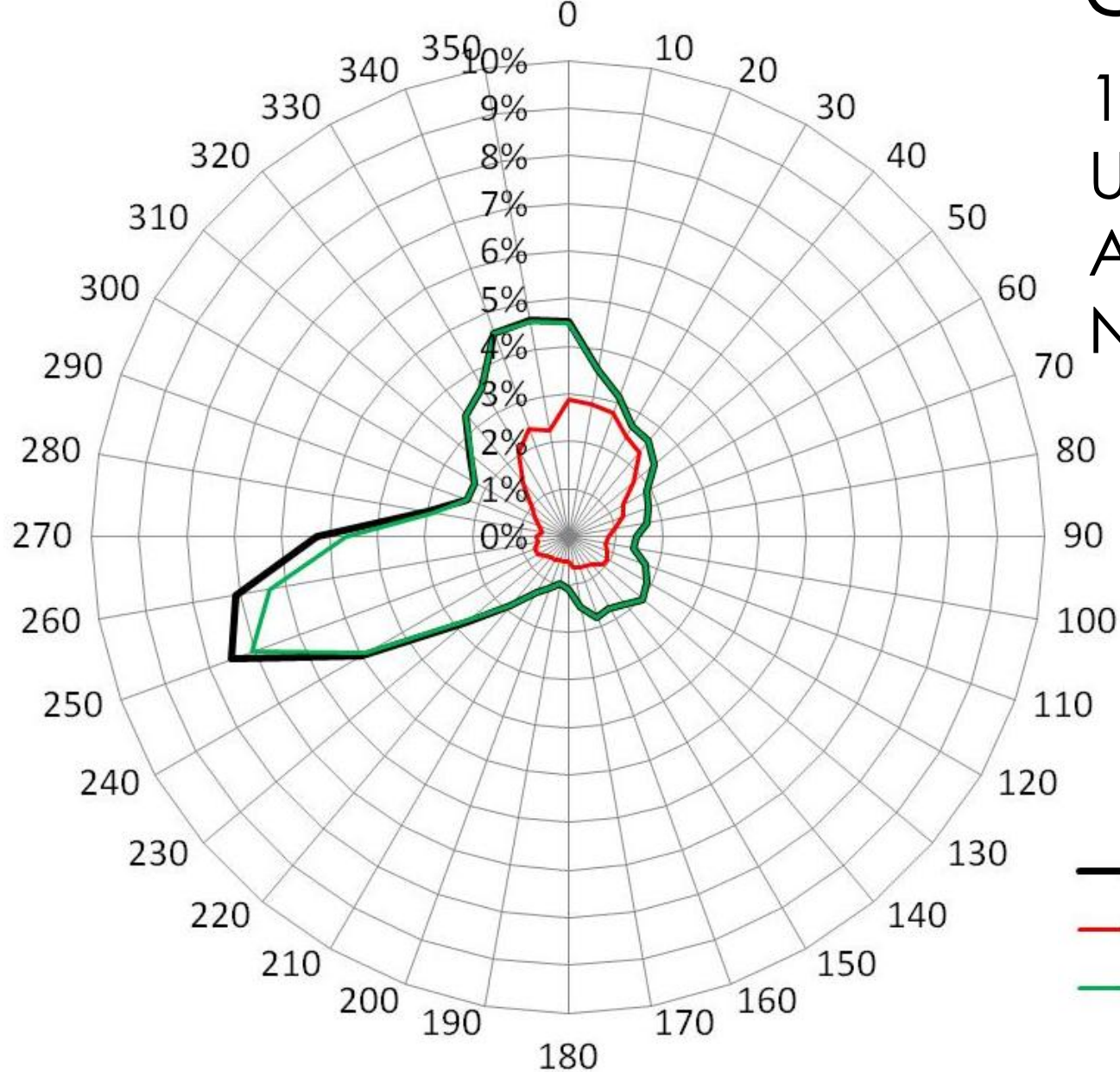
Tiwai Point

Invercargill Aero

1m/s = 3.6kph or 1.9knots or 2.2mph



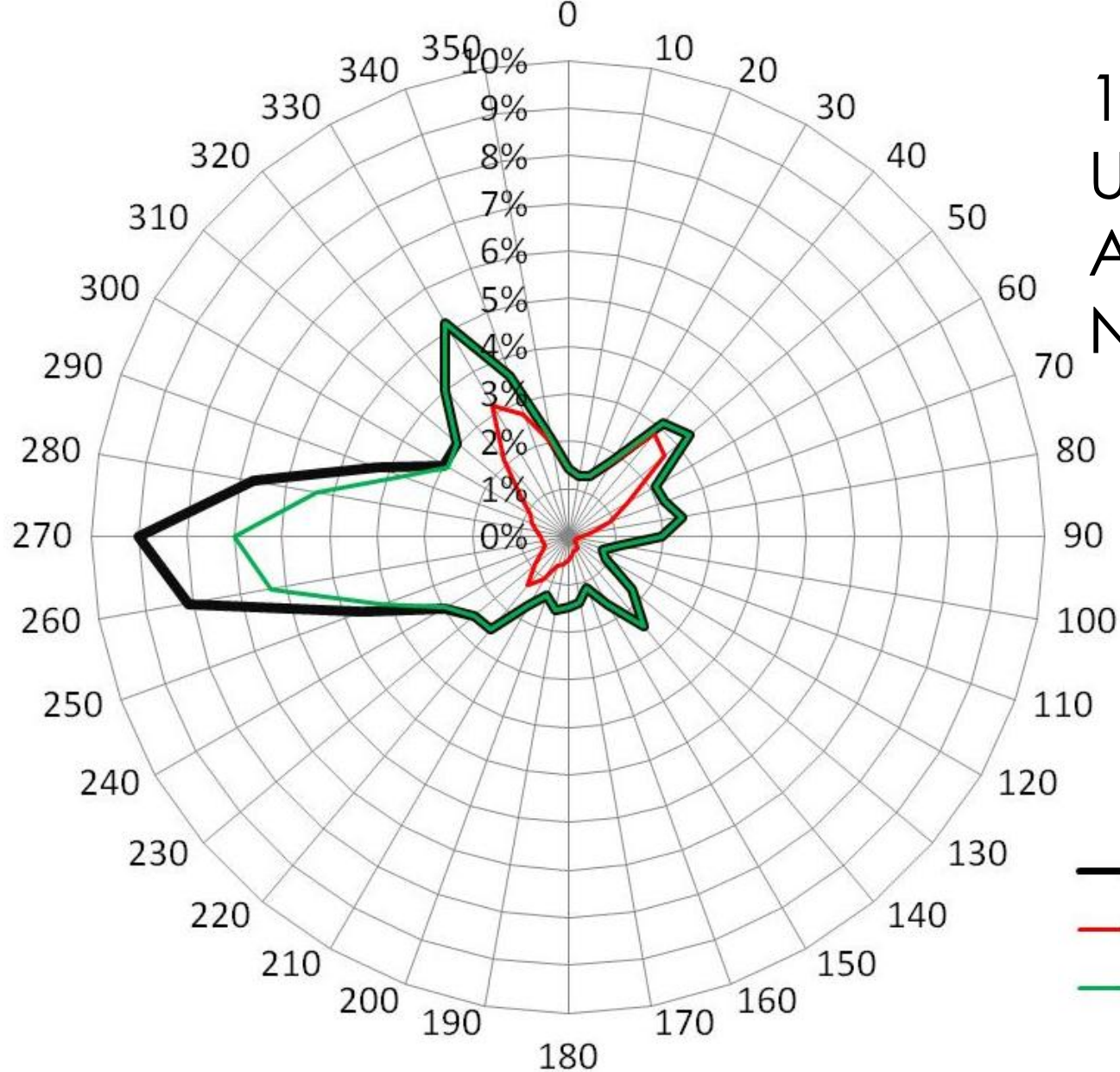
# Wind Rose - Invercargill Aero



10 yrs 1999-2010  
Up to 25m/s  
At 10 m height  
NW of buildings

- All data
- Usual start up wind speed 3m/s
- Usual rated wind speed 13m/s

# Wind Rose – Tiwai Point

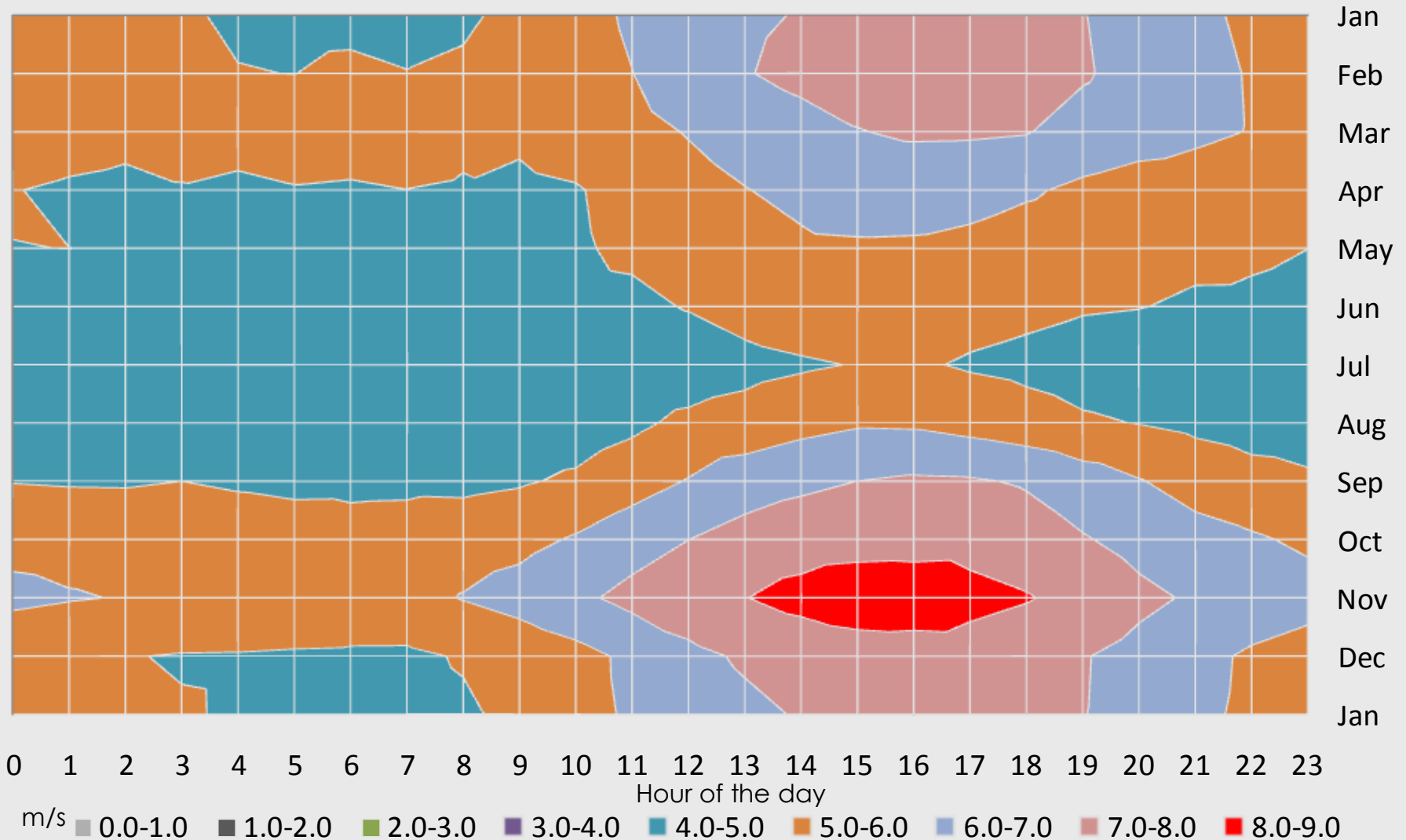


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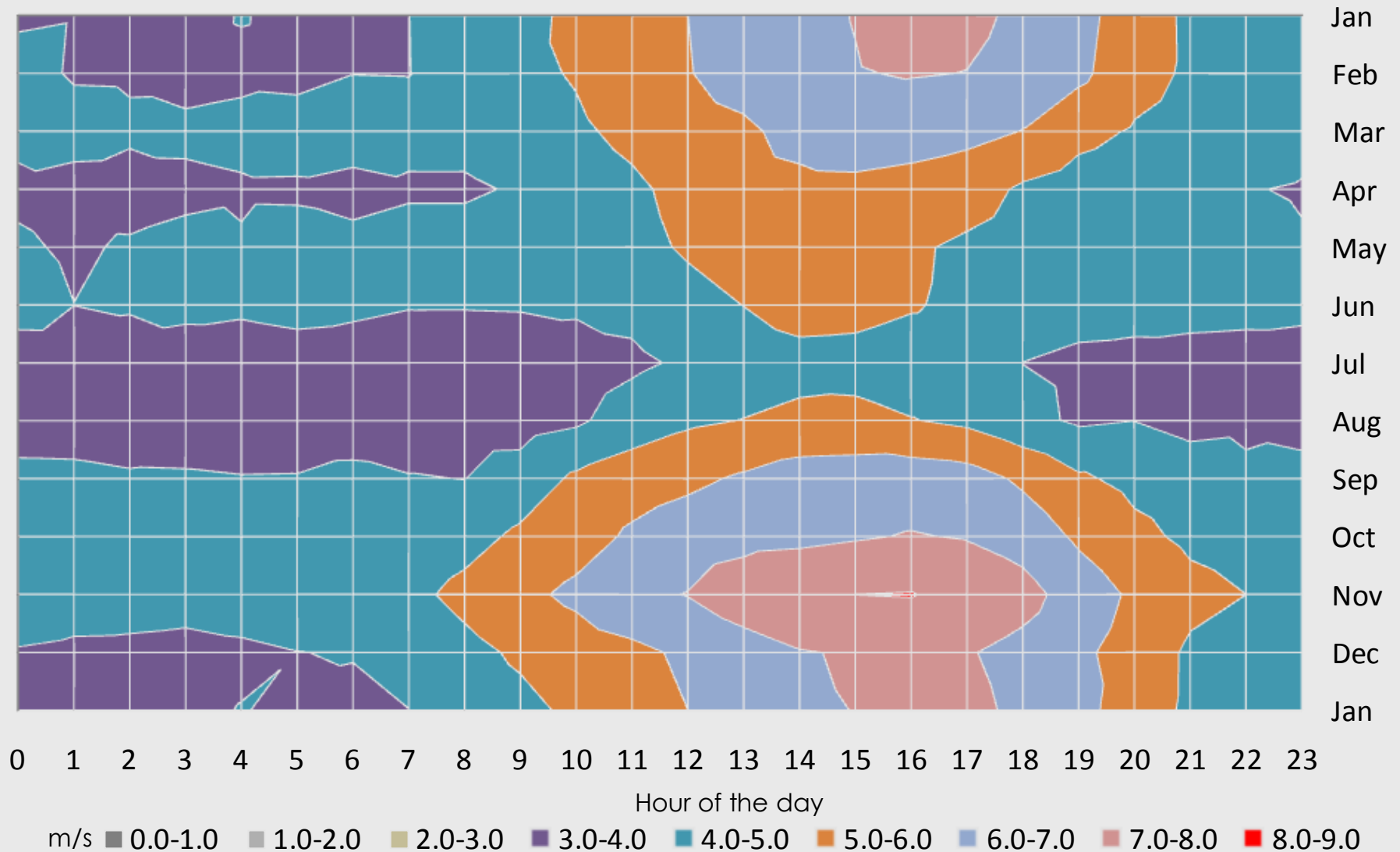
# Tiwai Point Wind Speed Map

Tiwai Point Mean Wind by Month and Hour from 1999 to 2010



# Inv. Aero Wind Speed Map

Invercargill Aero mean wind by Month and Hour for 1999 to 2010



# Wind Monitoring Towers

- Complete kits or individual components
- Multiple layers of monitoring instruments
- Instruments selected to suit the terrain
- As close to expected turbine hub height
- Up to 80m tall now readily available
- Launching footprint
  - up to 33-55m radius for guy ropes
  - up to the length of the tower on the ground into prevailing wind direction for lifting
- Clear (all weather) access for maintenance
- Costs vary depending on many site-specifics
- Installation is a specialist task
- Telemetry for data transfer is standard

# Wind Monitoring Towers

Componentry should include:

- Anemometers
  - up to 6 spread up the height of the mast with duplicates at some levels
- Direction vanes
  - Up to two instruments at two different levels
- Temperature
  - One instrument, usually at the 10m height
- Air pressure (optional)
- Data logger with telemetry
- Lightning protection

# Wind Monitoring Towers





# Wind Monitoring Towers



# Wind Monitoring Towers



# Wind data dependents

## Wind Energy Monitoring Programme

Wind Speed

Wind Direction

Air Temperature

Air Pressure

## Computed Quantities

Wind turbulence

Wind Shear

Air Density

Energy Density

## Dependents

Site wind flow modelling

Extrapolation to different heights

Site wind farm modelling

Micro-siting of turbines

Financial modelling

Equipment selection

Network modelling

Annual energy production

'Bankable' & verifiable data

Resource consent details

## Project Feasibility

To know what wind costs  
(\$/kWh)... ...you first  
need to know what wind  
is there (m/s)!

# Wind monitoring...

- Either independently or in conjunction with a Windfarm Developer.
- Wind resource defined...
  - Wind speed on the horizontal – wind turbine field of view
  - Wind speed in the vertical – convection and topography
  - Wind speed at a point vs a volume – anemometer vs SODAR
  - Wind speed at a point in time vs an interval of time
- Wind engineering needs wind data
  - Wind resource defined
  - Wind classes for equipment selection
  - Extreme wind speed calculations