

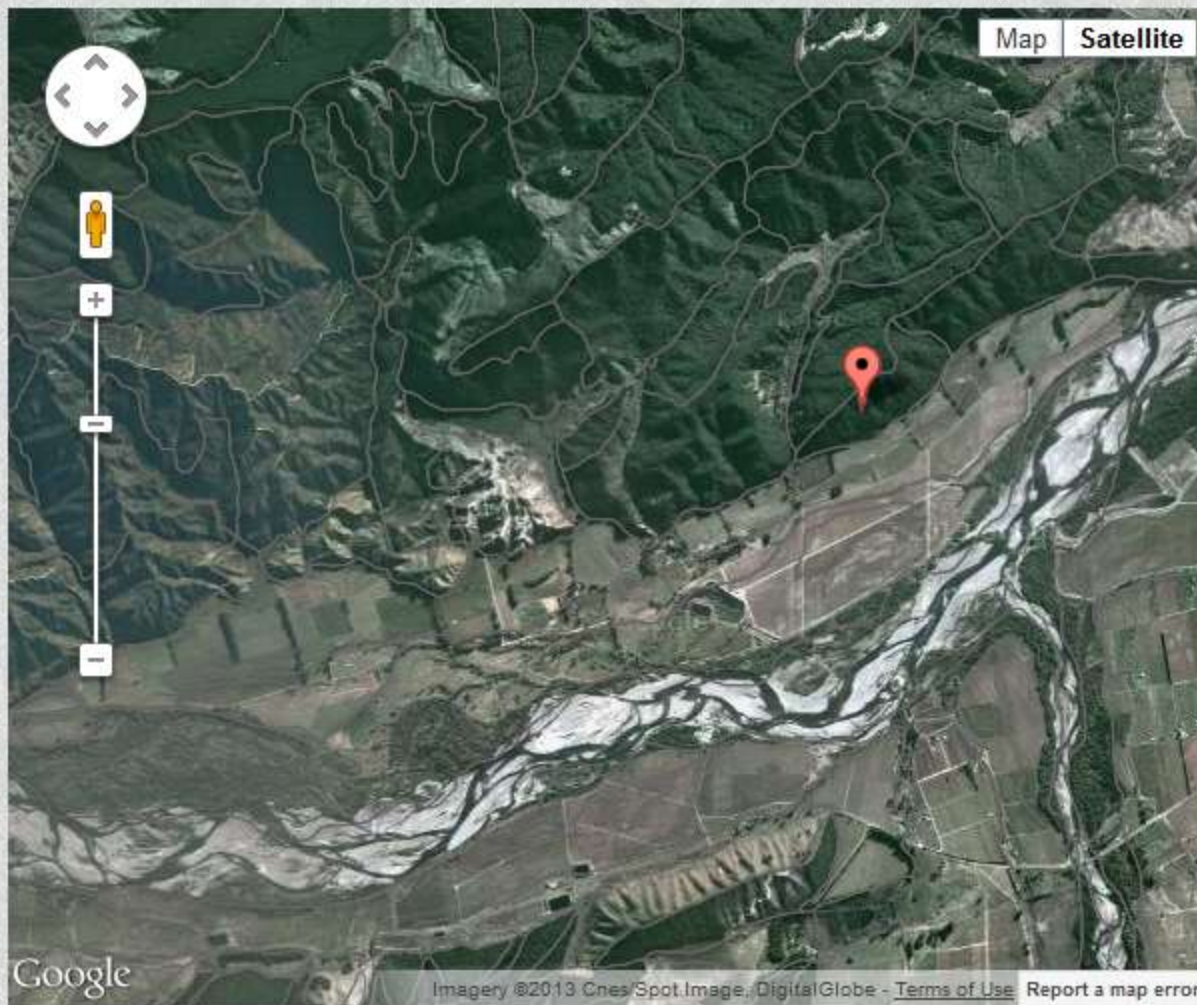
Site matching and modelling of NZDFI species

Euan Mason



Help with decision-making

- Assistance with site-species matching
 - Micro-level
 - Risks
- Estimates of productivity
 - Forest growth and yield
 - Products



Site:

Latitude: -41.4994

Altitude: 160

Longitude: 173.7139

Coast distance: 29

Soil Drainage: OK

Plant available water: 54

Soil texture: Silt loam

Rooting depth: 35

Total soil water: 100

Soil erosion risk: High

Mean annual rainfall: 980

Carbon:nitrogen ratio: 17

Soil pH: 5

Soil acid-soluble P rating: High

Cancel

OK

District:
Marlborough

Objective weights:

Production 50

Carbon 50

Shelter 0

Soil conserv. 0

Altitude (m): 0

Distance to sea (km): 12

Rainfall (mm): 732

Aspect S

Slope (deg): 20

Soil type:

Silt loam

Soil pH: 5.7

Acid-soluble P:

Moderate

C:N ratio: 12

Potential root depth (cm): 135

Soil water retention: OK

Drainage: OK

Go

Help

Google Maps

Harvest costs

Why?

Wildings

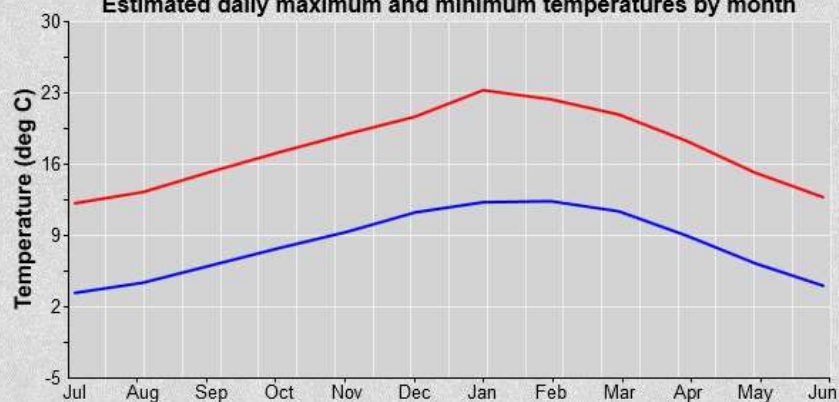
Species	Overall score	Productivity	Cold limitation	Water limitation	Carbon sequestration
Radiata pine	33	Medium	Minimal	Medium	High
E. globoidea	20	Medium	Medium	Medium	High
Corsican pine	10	Low	Minimal	Medium	Low
E. fastigata	9	Medium	Low	High	High
Ponderosa pine	3	Low	Minimal	High	Low

Estimated potential productivity (assuming good nutrition) = **Medium**Estimated nutritional status (from C:N ratio) = **High**Estimated response to P fertilisation = **High**

Estimated mean annual temperature = 12.7 degrees C.

Estimated erosion susceptibility = **Low**

Estimated daily maximum and minimum temperatures by month



Estimated available soil water by month, with Radiata pine LAI=3





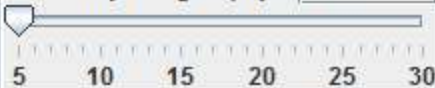
Altitude (m) 40.0



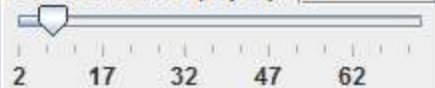
Current age (years) 7.0



Mean top height (m) 5.0



Basal area/ha (sq m) 8



Maximum dbhob (cm) 18.0



Dbhob std. dev. 2



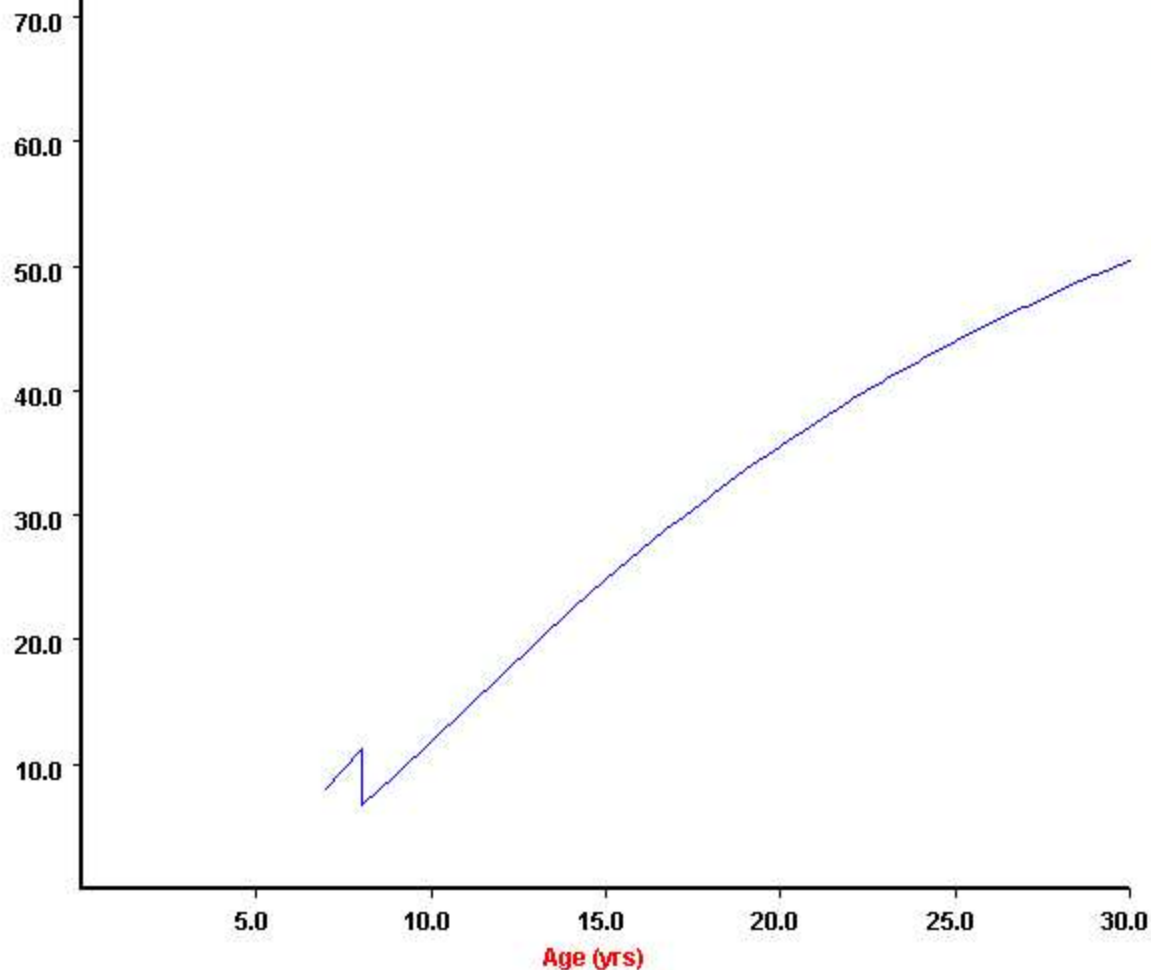
Stems/ha 504



Projection age (years) 30



Basal area/ha (sq m)





Altitude (m)

40.0



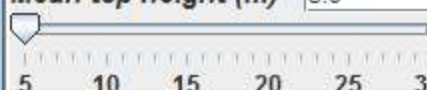
Current age (years)

7.0



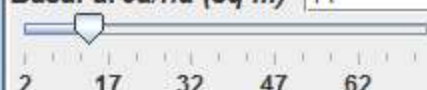
Mean top height (m)

5.0



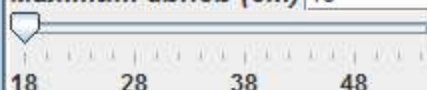
Basal area/ha (sq m)

14



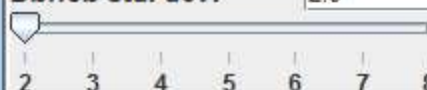
Maximum dbhob (cm)

18



Dbhob std. dev.

2.0



Stems/ha

1205

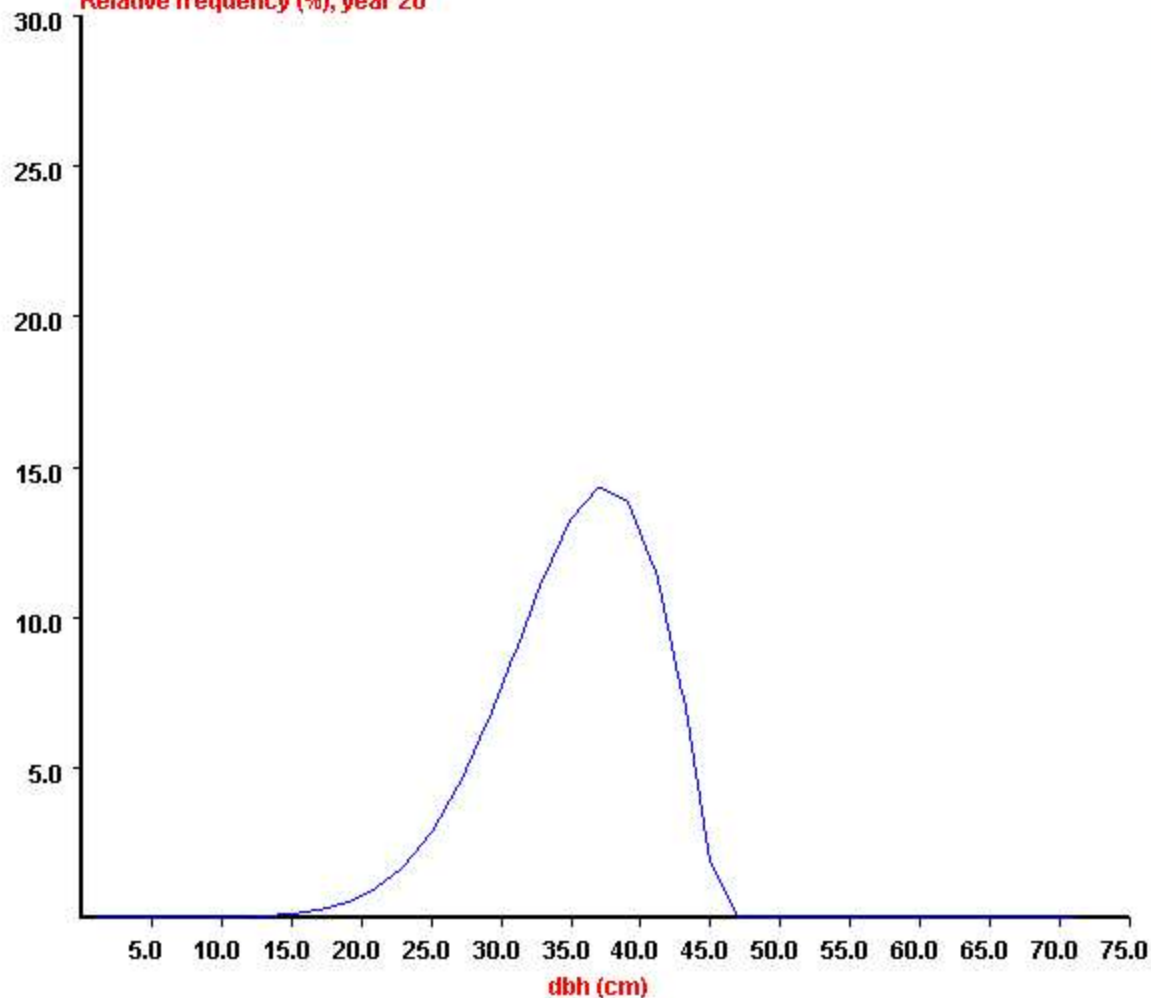


Projection age (years)

30

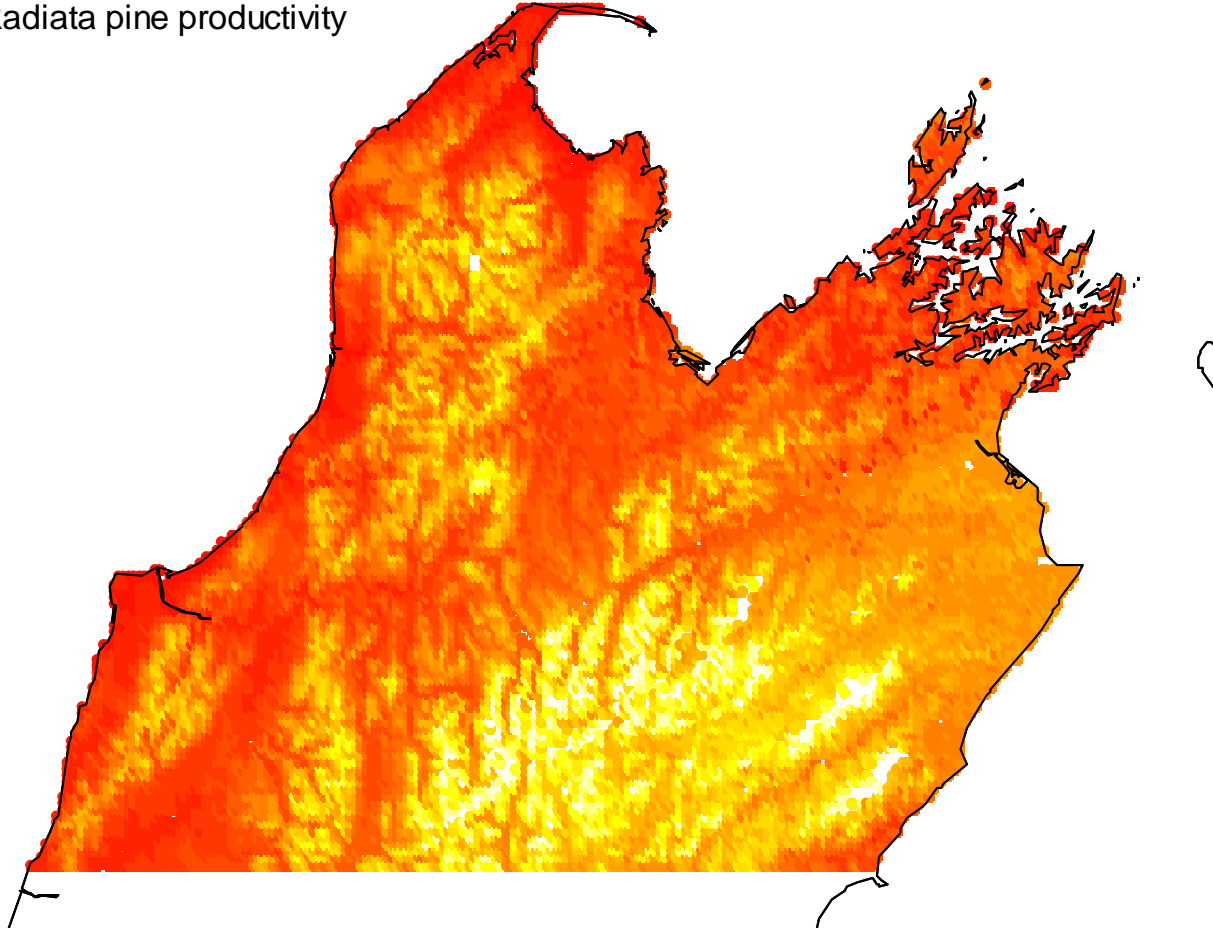


Relative frequency (%), year 26



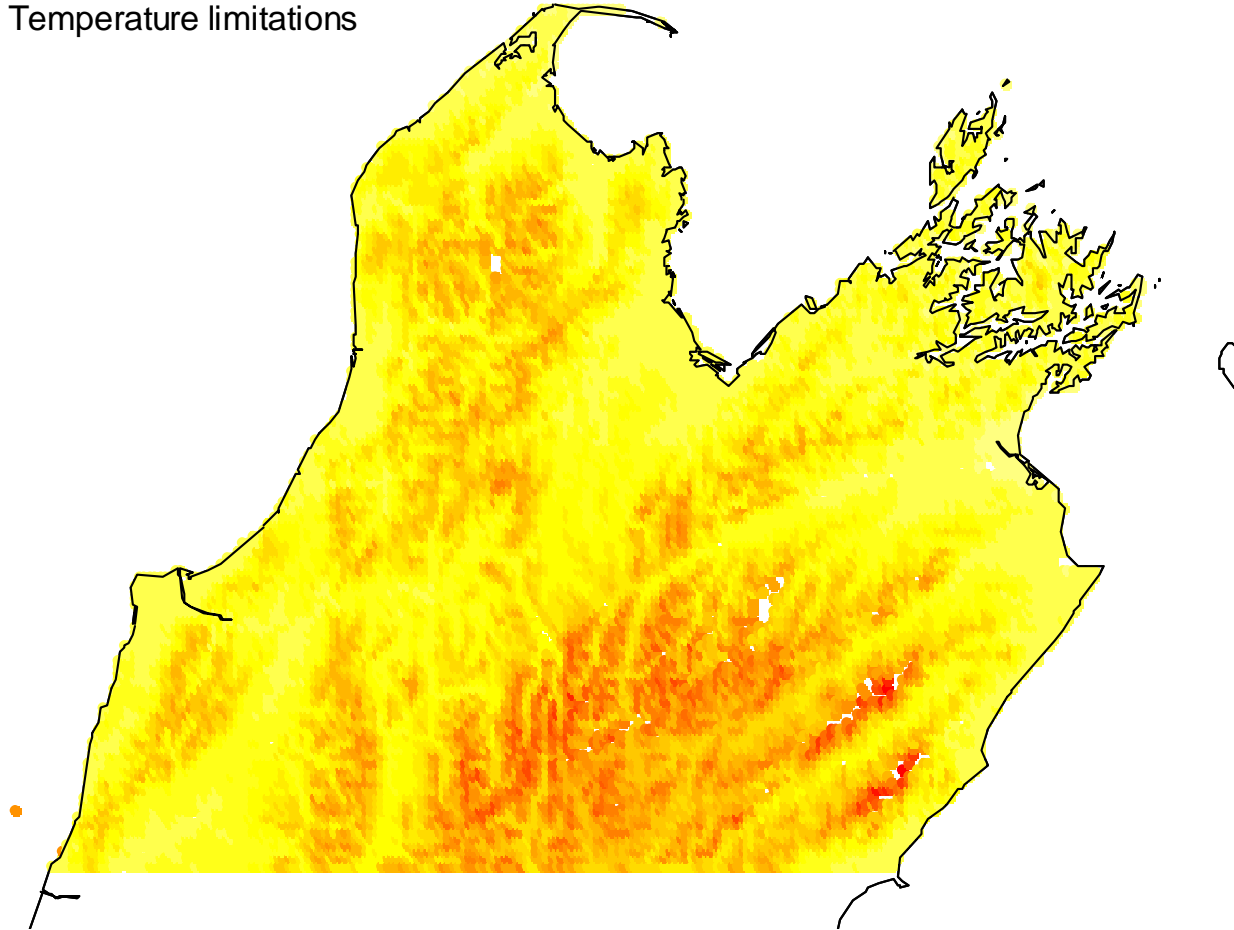
Productivity

Radiata pine productivity



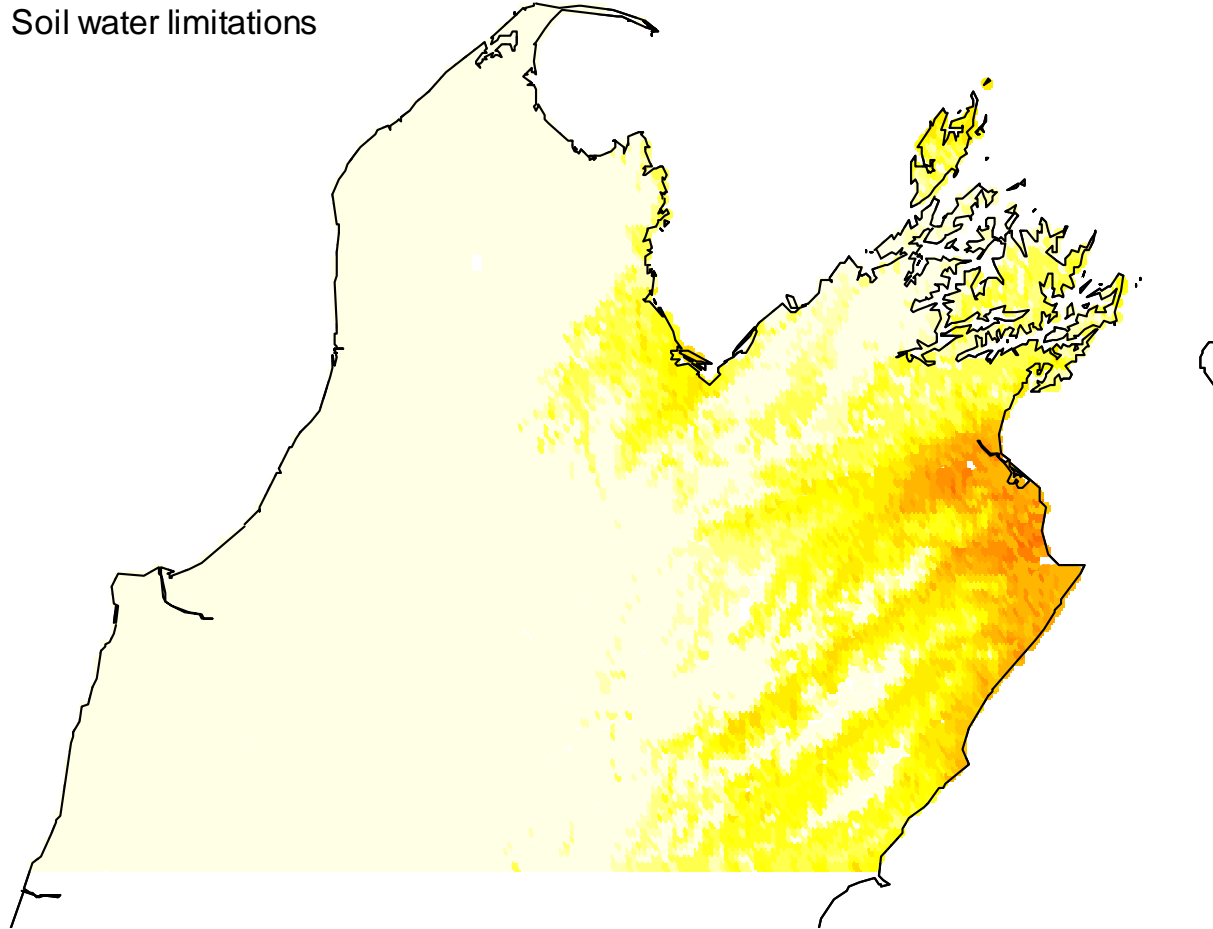
Temperature limitations

Temperature limitations



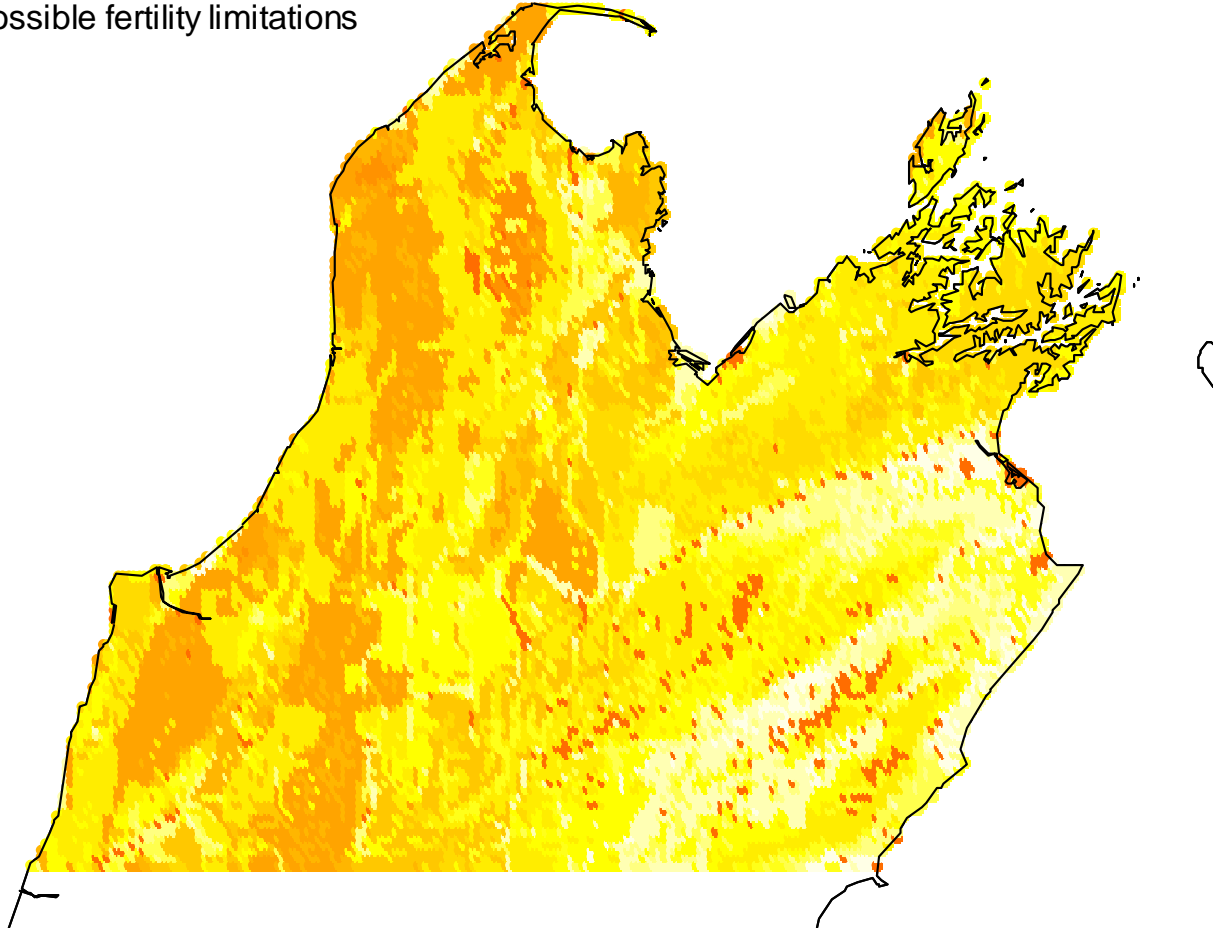
Soil water limitations

Soil water limitations



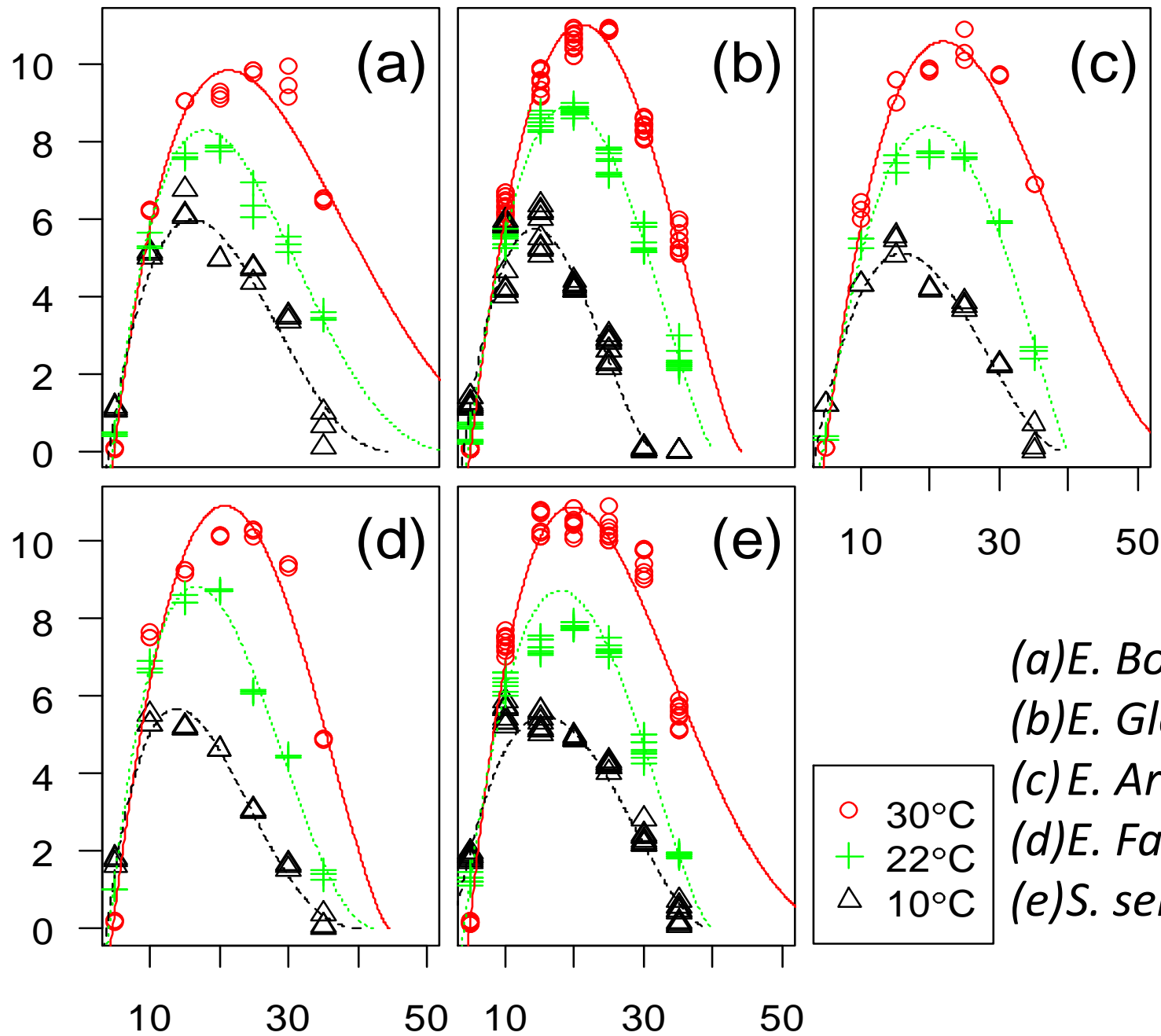
P & N nutritional limitations?

Possible fertility limitations



Status: Rough

Assimilation of CO₂ ($\mu\text{mol m}^2 \text{sec}^{-1}$)

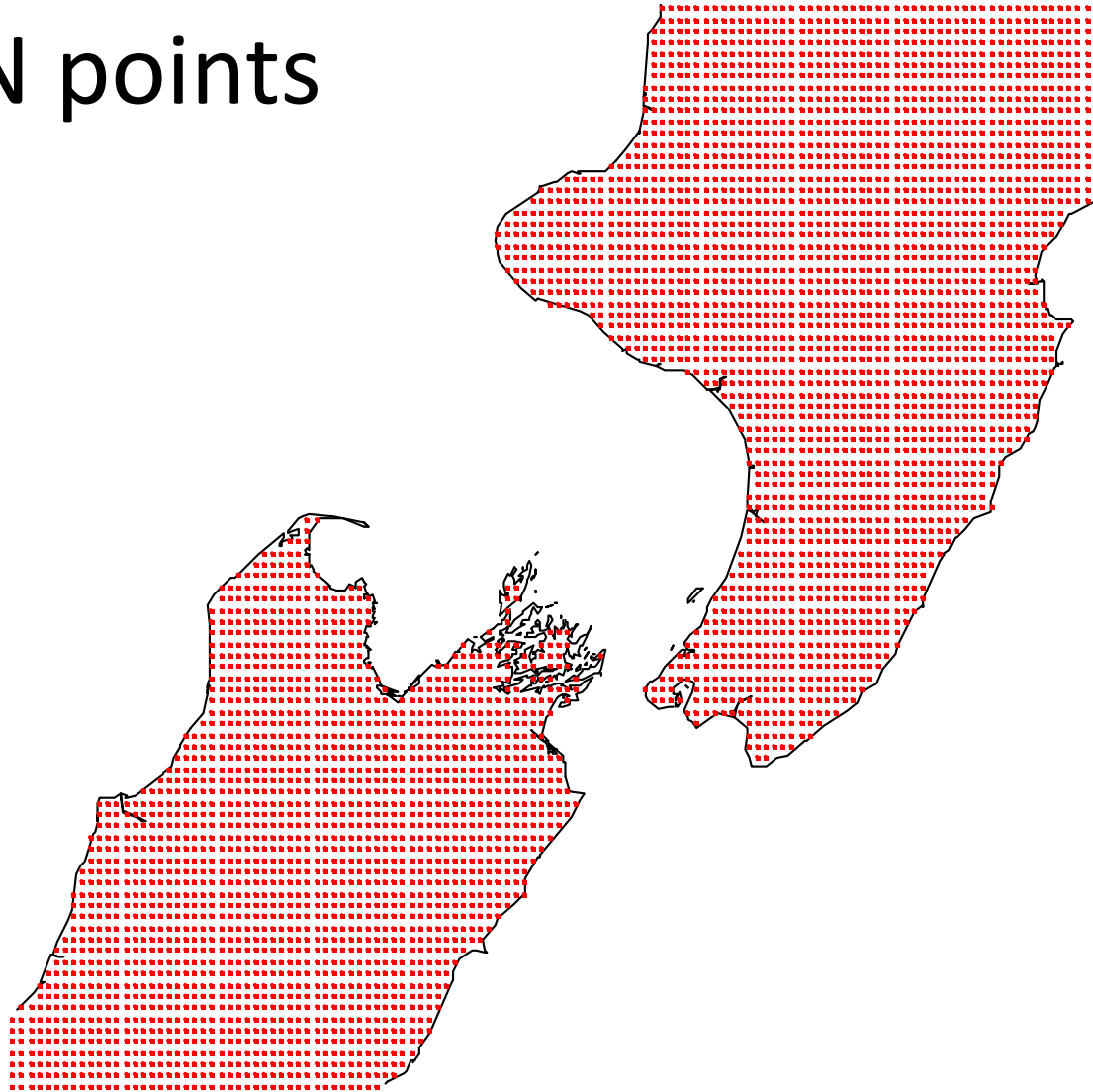


Leaf Temperature ($^{\circ}\text{C}$)

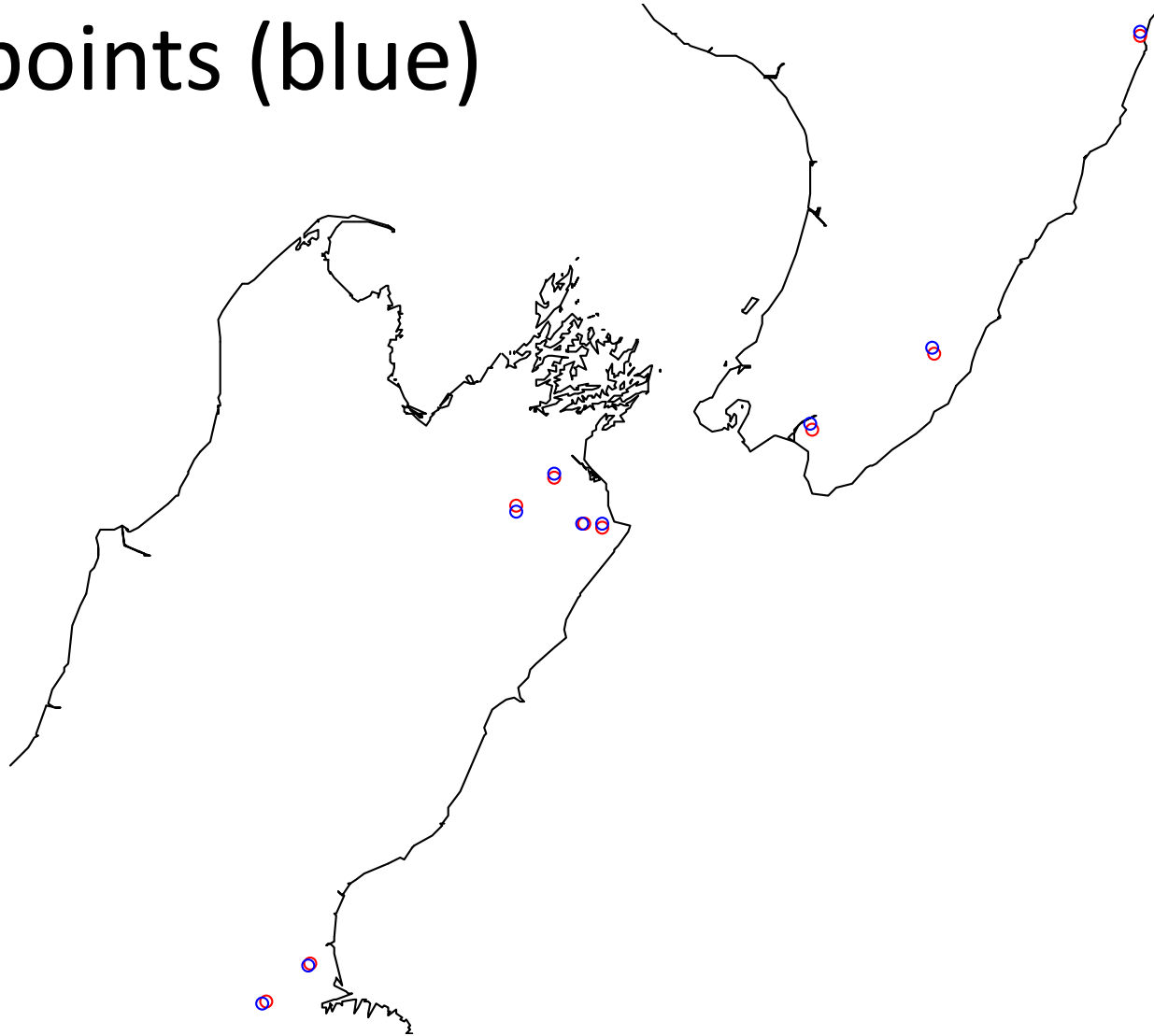
How can we localise NIWA estimates?

- Nine independent meteorological stations
- Two sources of data from NIWA
 - Closest met station
 - Virtual climate station network
 - Daily estimates on a 5 x 5 km grid

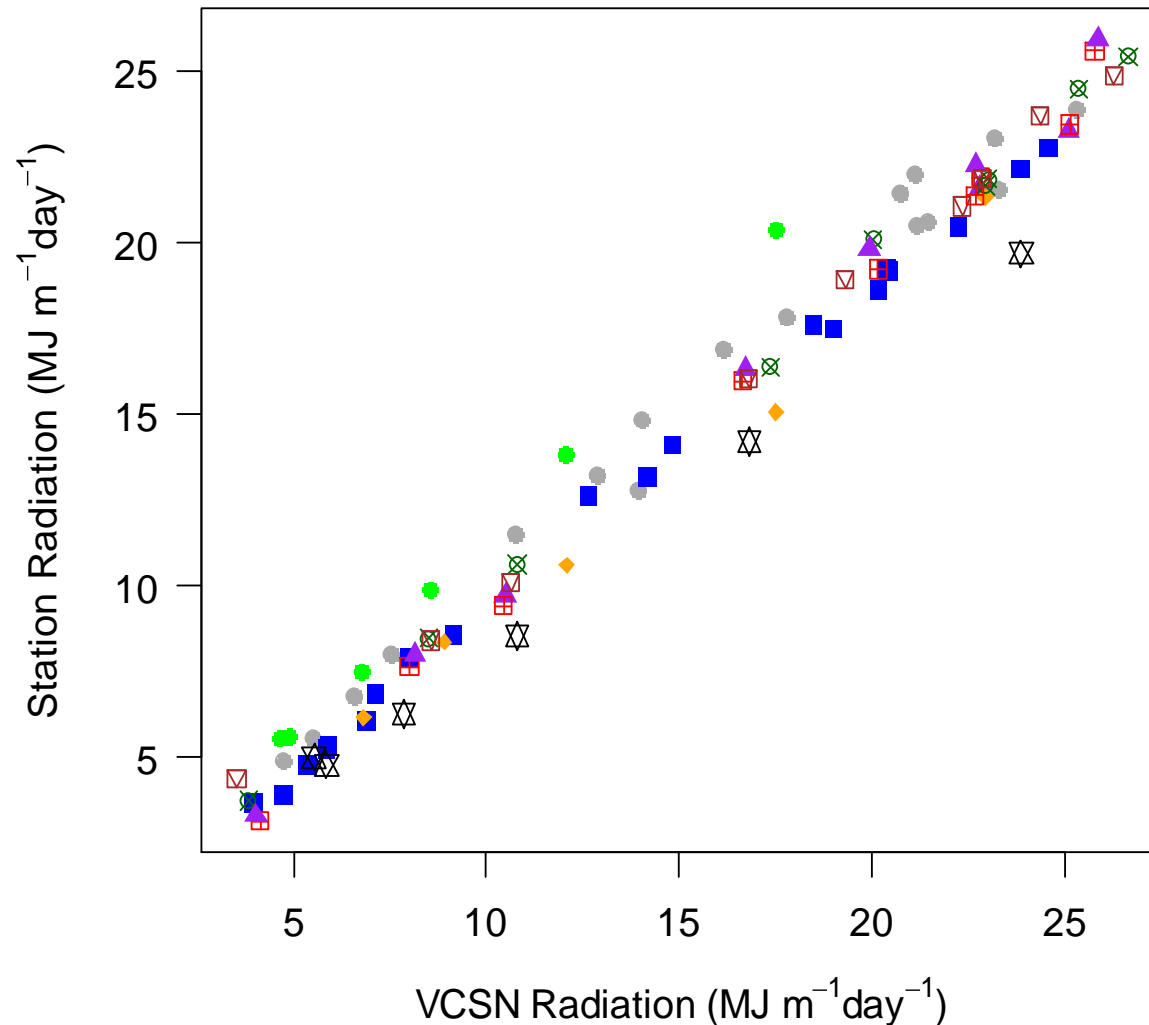
VCSN points



Our stations (red)
VCSN points (blue)

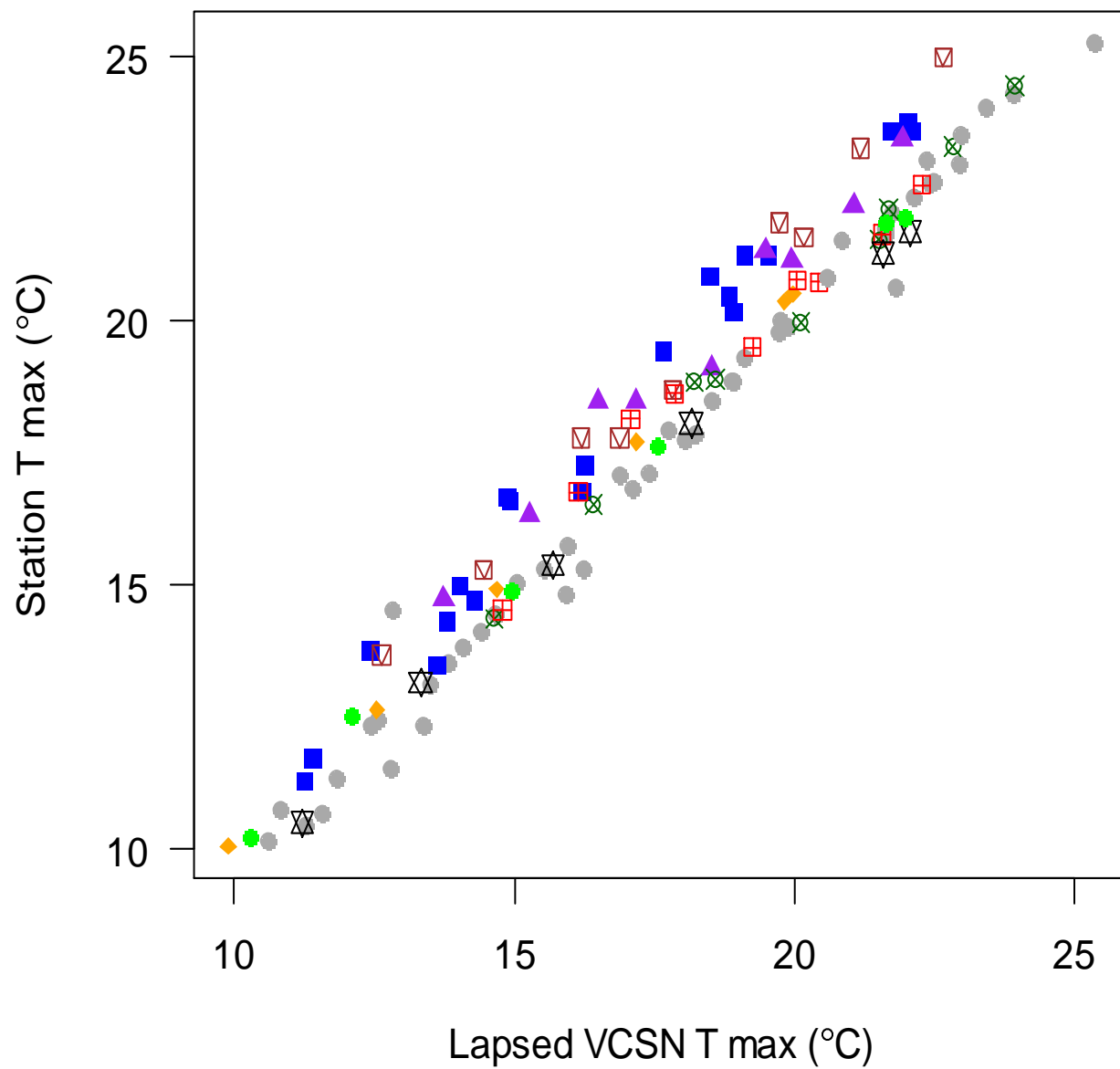


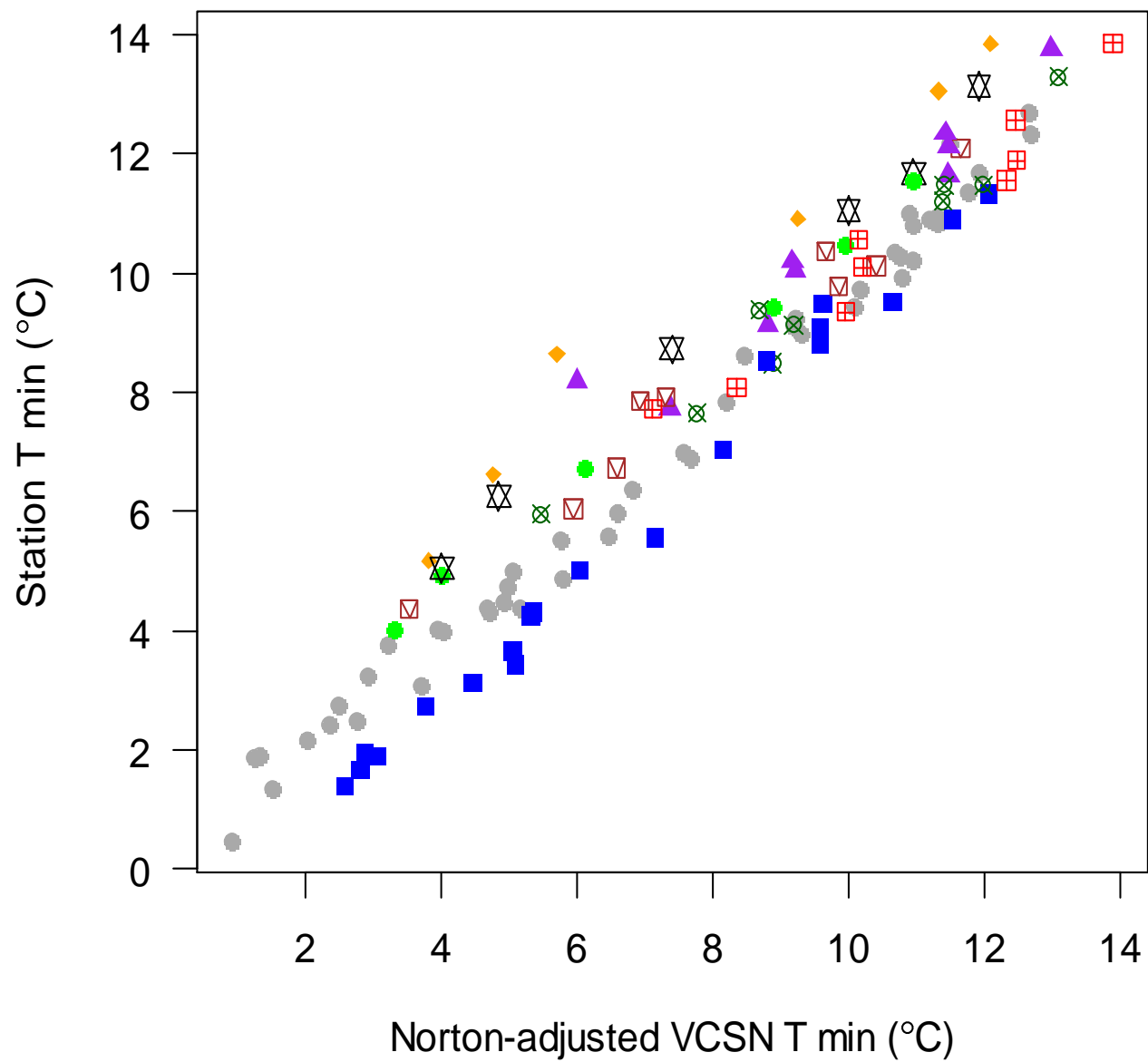
Monthly radiation from VCSN best ($R > 0.99$)

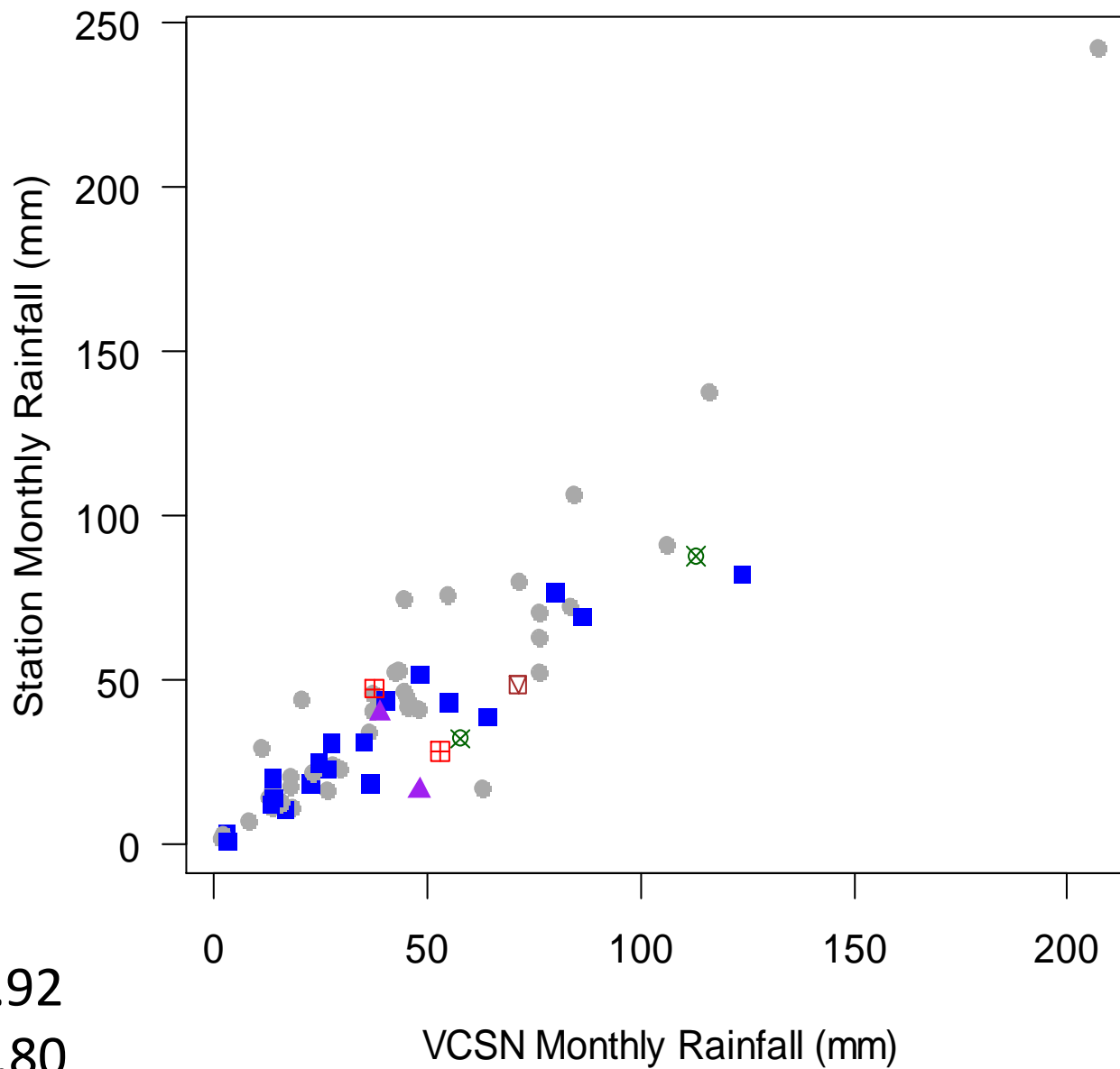


Temperature correlations

Type	Maximum	Minimum
Raw VCSN	0.9731	0.9752
Lapsed VCSN	0.9816	0.9671
Norton VCSN	0.9812	0.9722
Raw NIWA station	0.9553	0.9142
Lapsed NIWA Station	0.9697	0.8951
Norton NIWA station	0.9723	0.9125





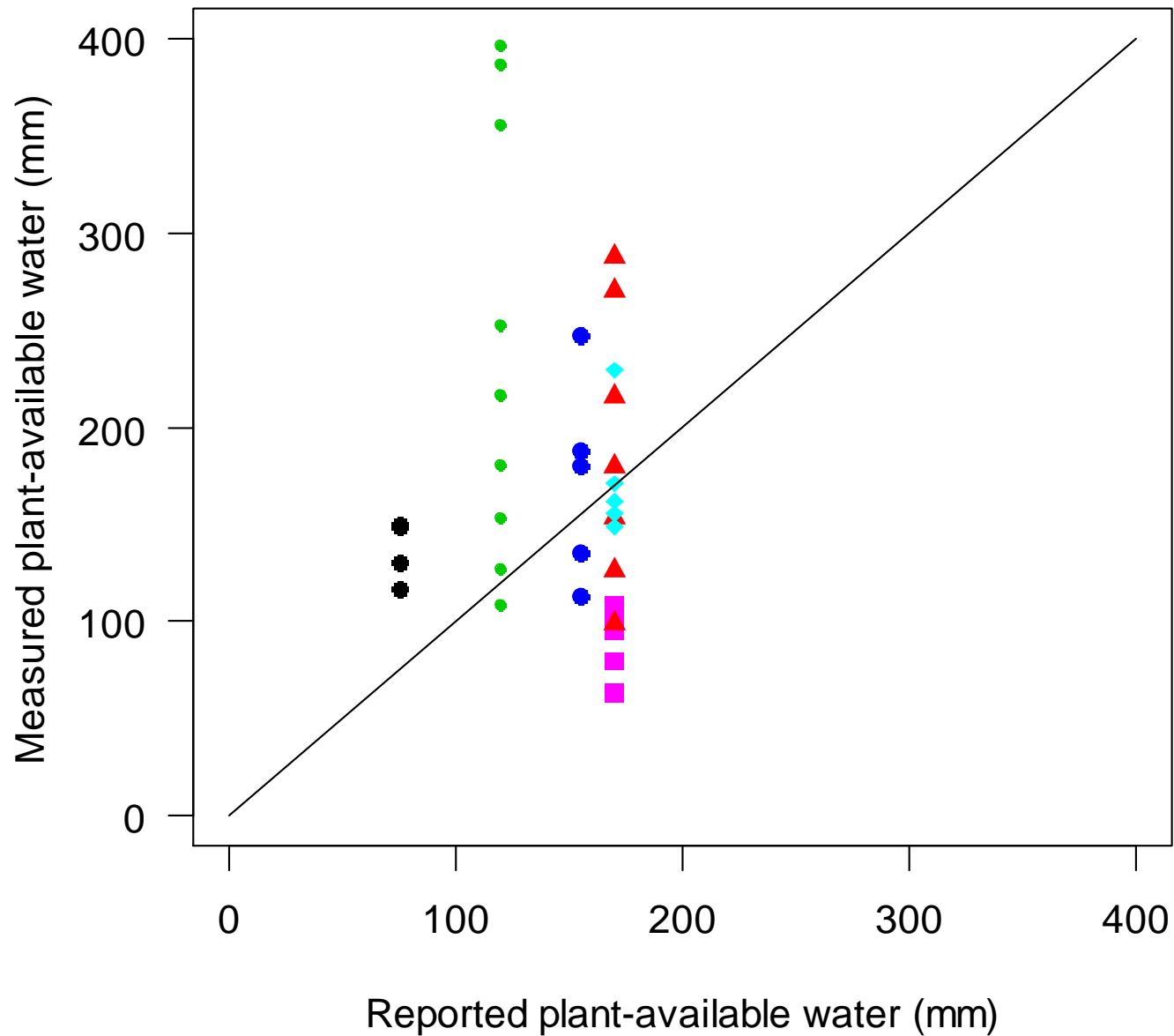


R values:

VCSN 0.92

Met stn 0.80

Pilot study in Canterbury, preliminary results – Malte Coulmann



Implications

- VCSN estimates are better than those from the nearest met station for all variables
- Radiation is well estimated at specific points in the landscape
- Temperature can be localised using adiabatic or Norton adjustments
- Dry areas are likely to have more biased estimates of productivity than wet areas
 - Rainfall is very local and roughly estimated by the VCSN
 - Maximum available soil water is poorly estimated

Slope and aspect



Can be obtained from 15 x 15 m
digital elevation model



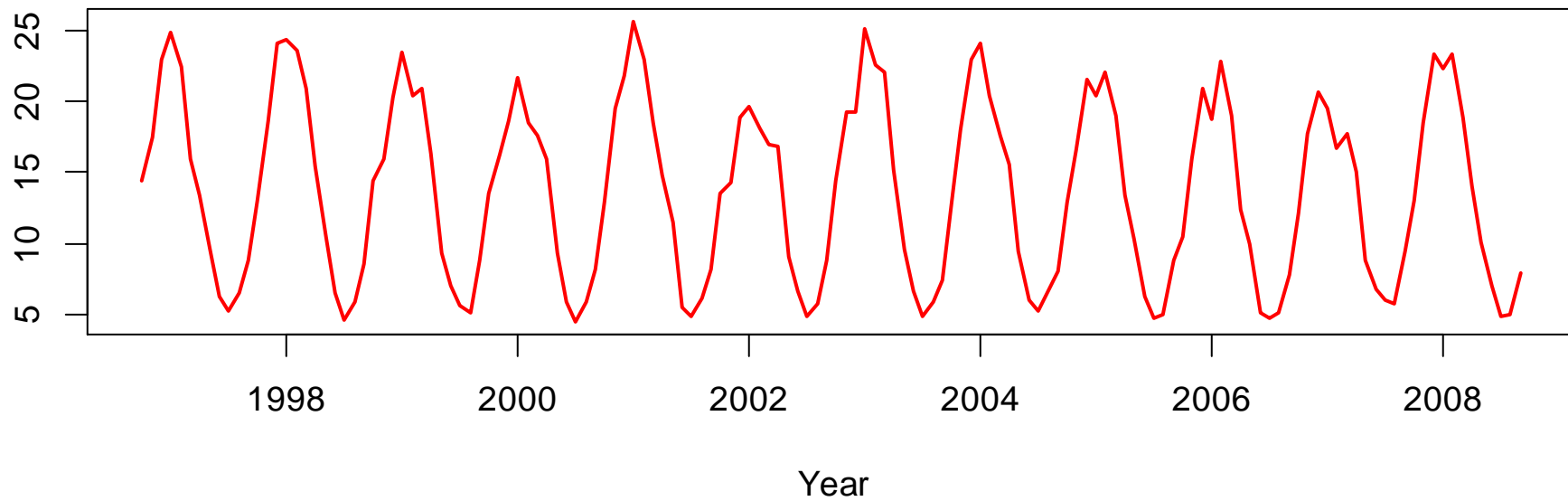




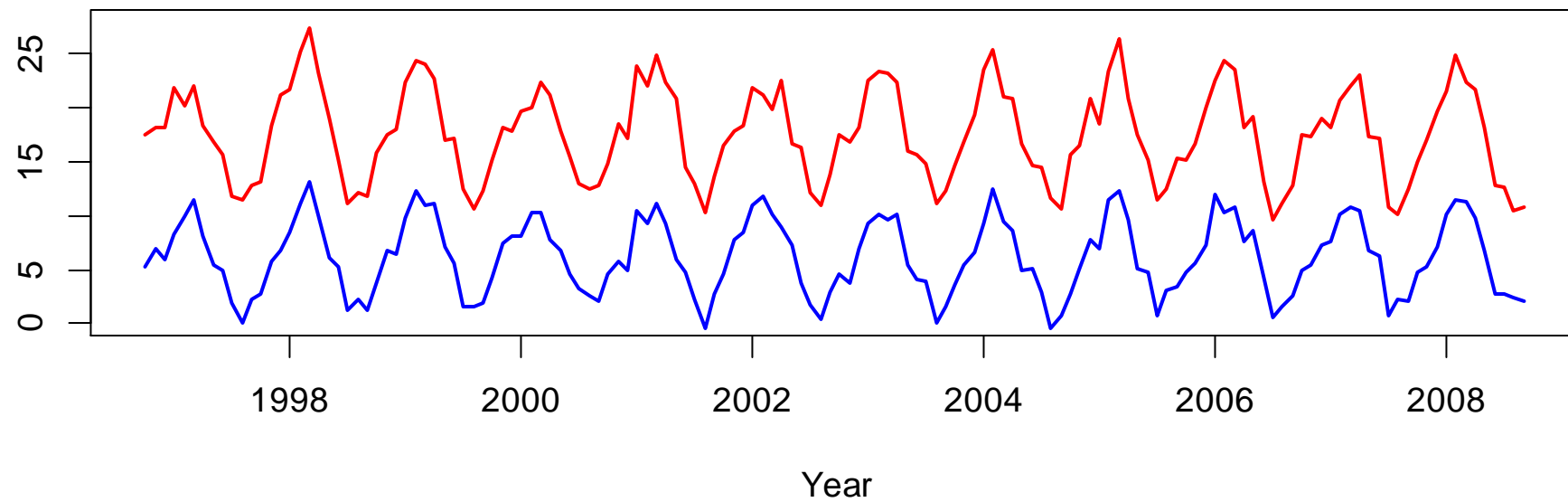
Impacts of slope and aspect

- Radiation
 - Software now built
- Temperature
 - Data needed
- Soils
 - Study underway by Serajis Salekin (PhD student)
 - Comprehensive soil survey on two sites
 - Aspect and slope
 - Distance from top and/or bottom of slope

Radiation MJ/m²/Day

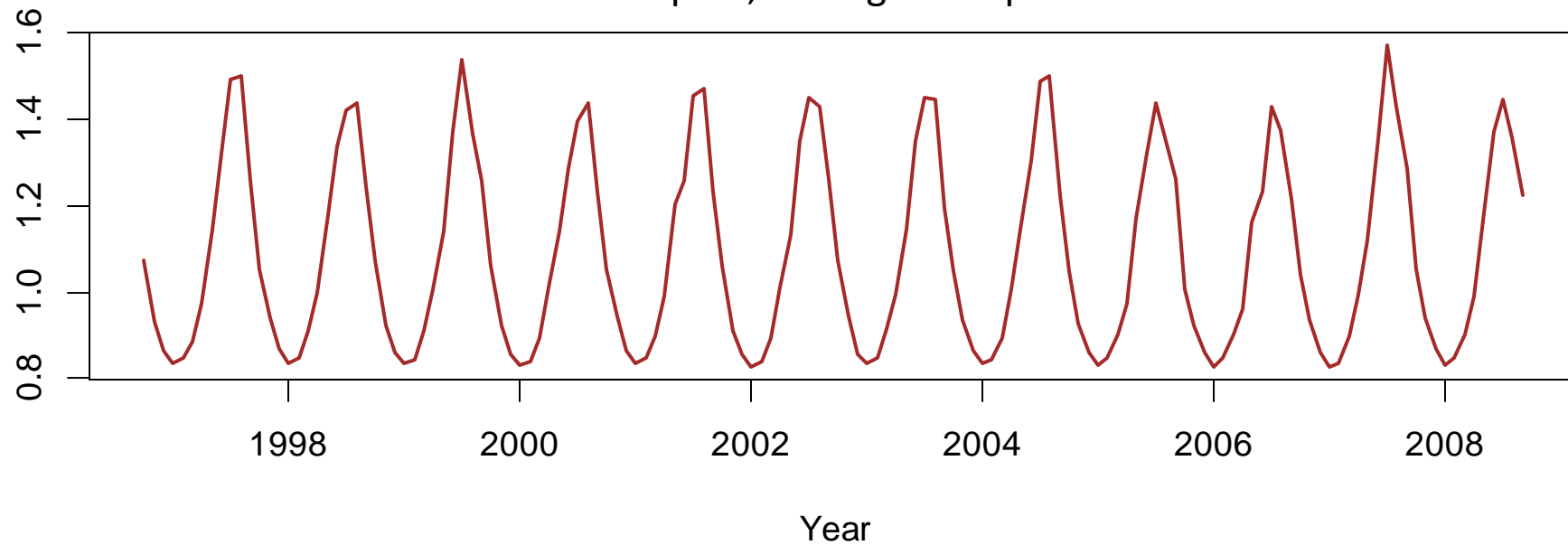


Temperature (deg C)

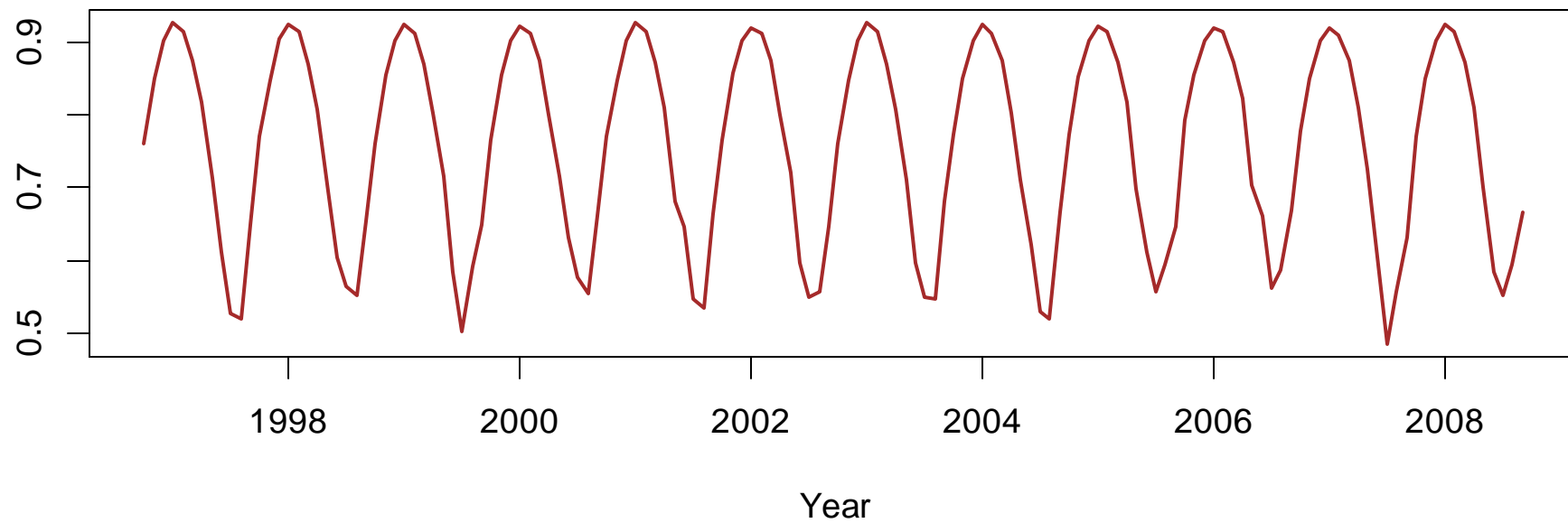


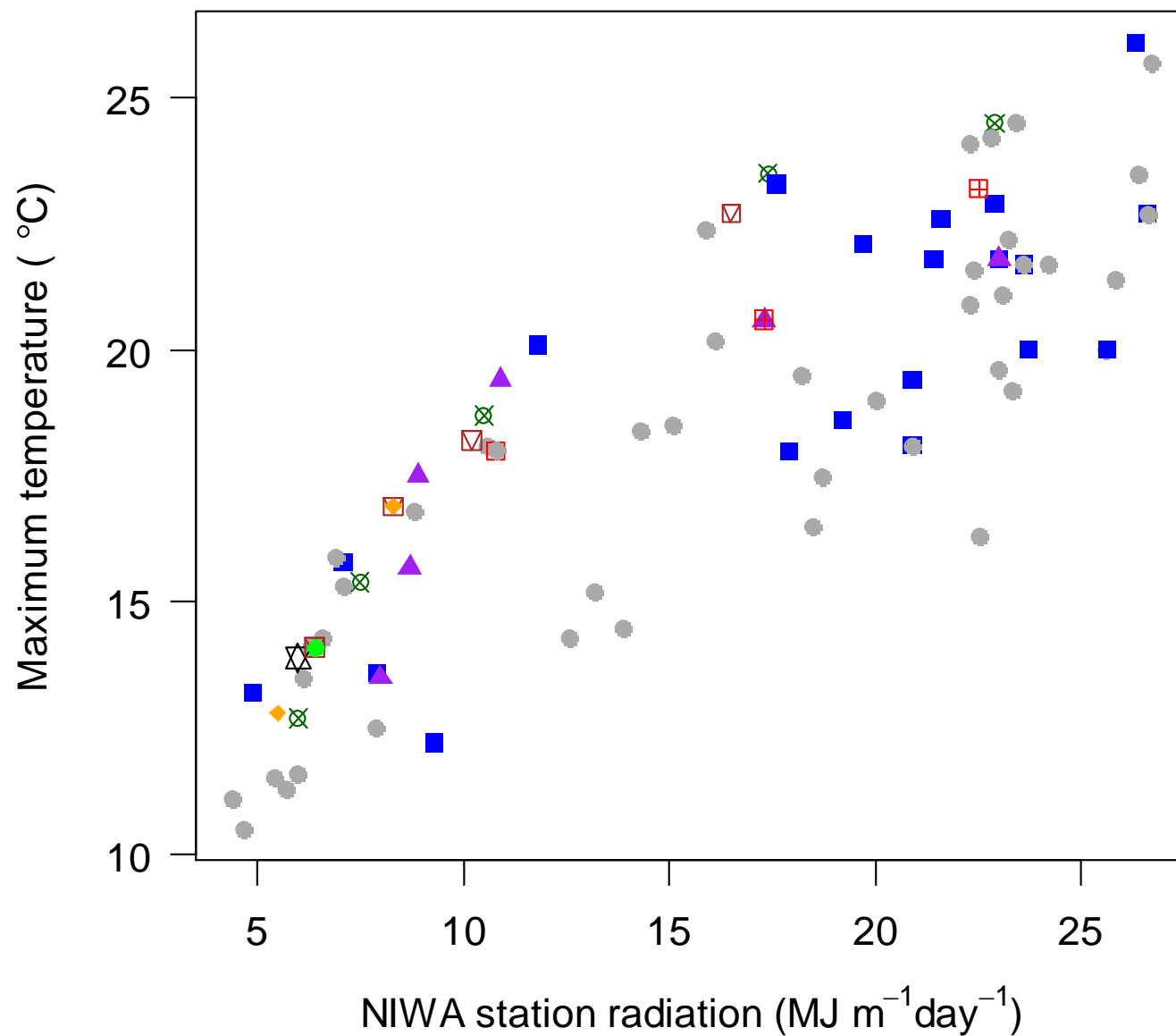
Proportion of radiation hitting slope (MJ/m²)

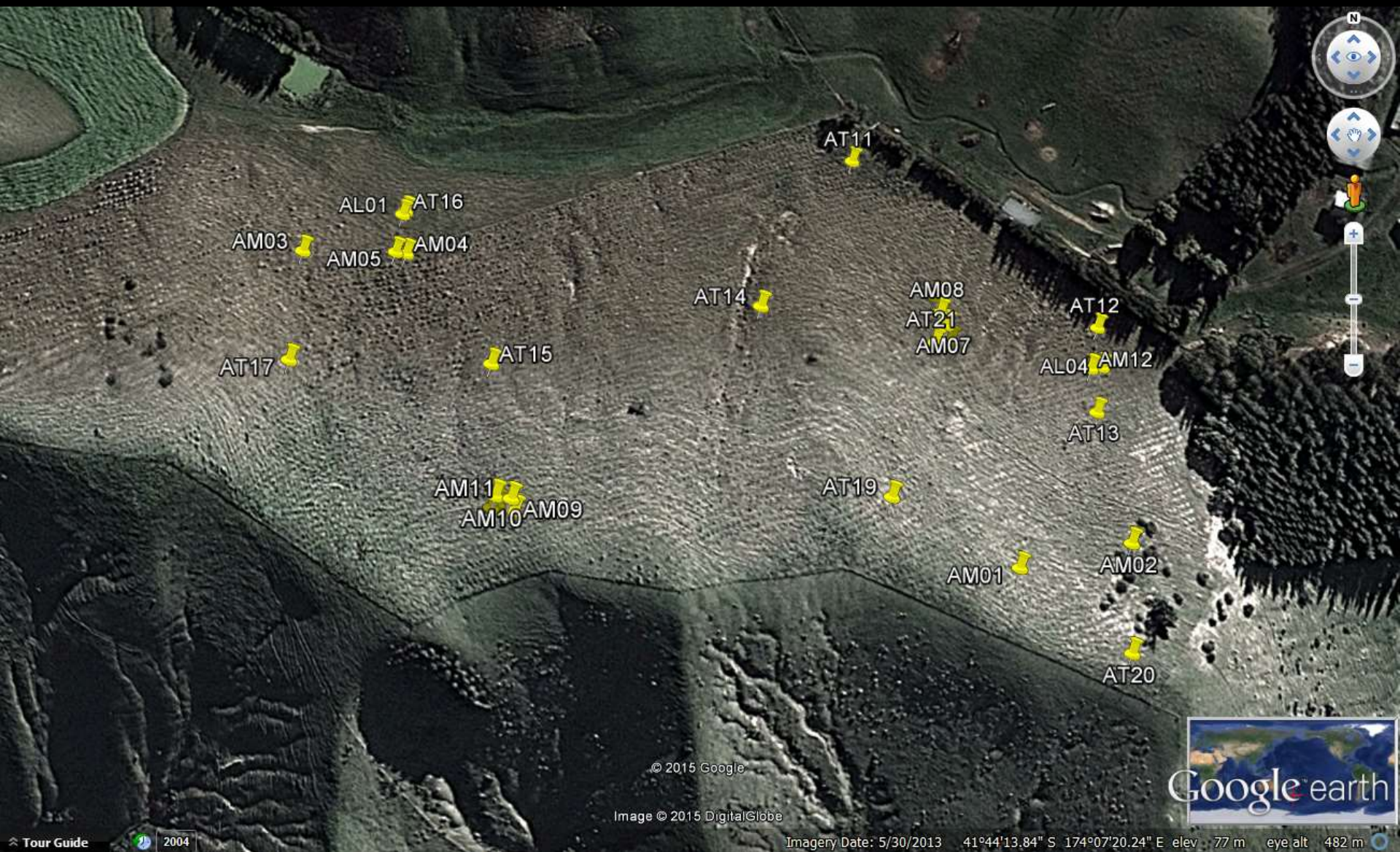
North aspect, 25 degree slope



South aspect, 15 degree slope







AT11
AL01 AT16
AM03 AM05 AM04
AT14
AM08
AT21
AM07
AT12
AL04 AM12
AT13
AT17
AT15
AM11
AM10 AM09
AT19
AM01
AM02
AT20

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Imagery Date: 5/30/2013 41°44'13.84" S 174°07'20.24" E elev 77 m eye alt 482 m

Tour Guide

2004



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LT10

Key points

- Decision-making tools
 - Species-site matching
 - Growth and yield
- Studies underway
 - How to localise important variable estimates
 - Microsite variation
 - Aspect & slope, soils
 - Landscape level productivity
 - Risks
- Software under development