

“Southside” - bridging the hemispheres New Zealand vs. Europe

Global use of field trials based on ecoregion similarities

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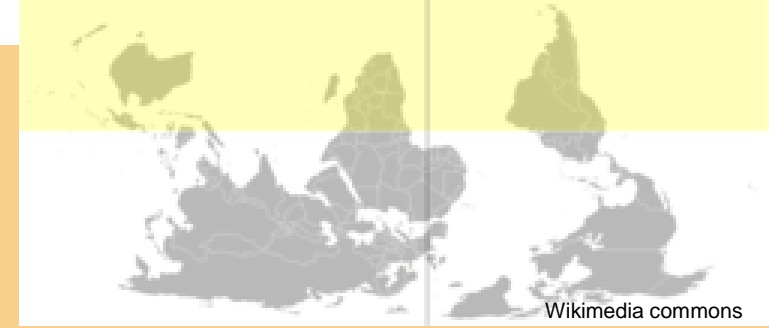
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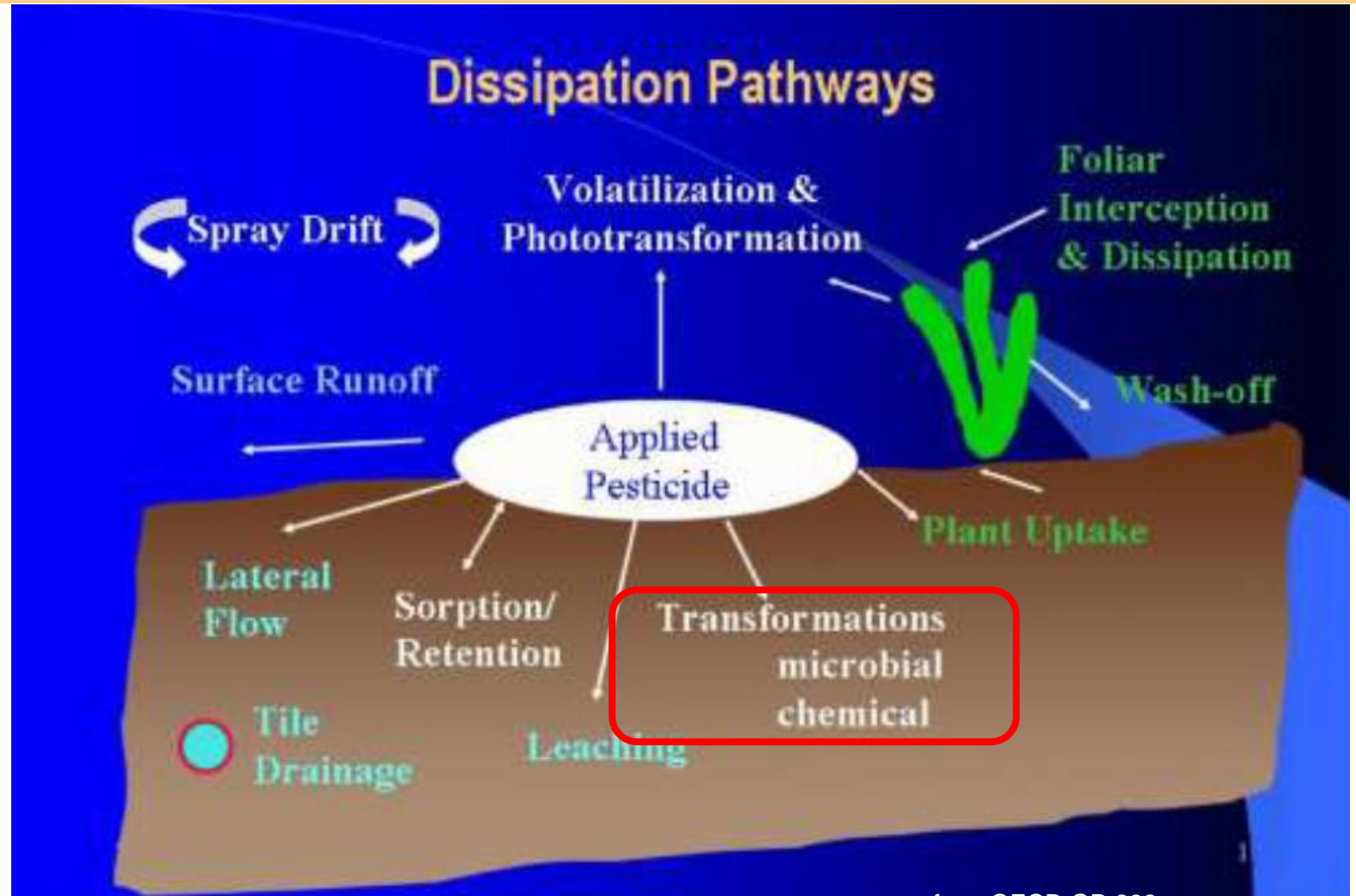


- The OECD developed a guidance document for conducting pesticide terrestrial field dissipation studies (OECD 2016, GD 232) to determine persistence, dissipation, **degradation rates**, leaching, etc. in the field.
- An Ecoregion Similarity Model (ENASGIPS) is described for ecoregion crosswalk to get acceptance of field studies *conducted* in NAFTA to Europe and vice versa.
- While the tool is currently used across regions in the Northern hemisphere, there is **no obvious scientific reason why its applicability should not be extended to other regions of the world.**
- An experimental and GIS/modeling feasibility study was conducted to investigate whether TFD-studies in the *Southern hemisphere* may deliver similar endpoints (degradation rates in soil, DegT50) than those from the *Northern hemisphere* → “Southside”

Conceptual Model of the Factors affecting the Field Dissipation of a Chemical

- Focus of this work: **rate of chemical / microbial transformation in soil**

→ Sub module DegT50



Ecoregion Similarity Assessment

Site Selection | User Sites | Crop Density Mapping

Holistic Ecoregion Similarity | Weights of Evidence Similarity

PA0445 - Western European broadleaf forests (EU)

Select ecoregions in opposite continent only

Similarity Model Threshold Value (%) 80

Use Selected Ecoregion

Run Model

Show Model Results

Generate HTML Report

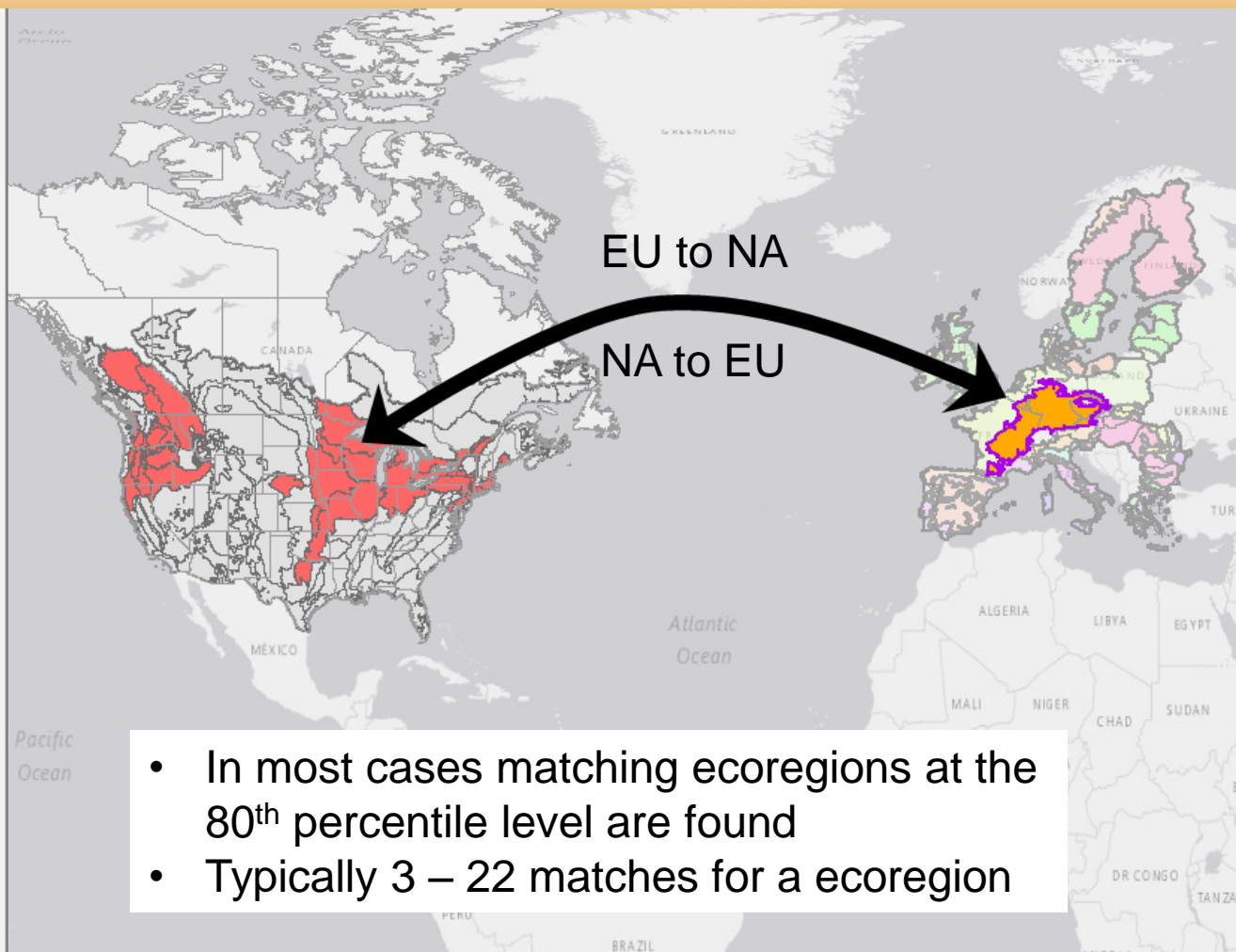
Clear Model Results

Display Similar Ecoregions

- NA0401 - Allegheny Highlands forests (USA)
- NA0407 - Eastern Great Lakes lowland forests
- NA0411 - Northeastern coastal forests (USA)
- NA0414 - Southern Great Lakes forests (CA,U
- NA0415 - Upper Midwest forest-savanna trans
- NA0416 - Western Great Lakes forests (CA,U
- NA0417 - Willamette Valley forests (USA)
- NA0505 - Blue Mountains forests (USA)
- NA0508 - Central and Southern Cascades fore

Selected Root Ecoregion

Above Similarity Threshold



Choices that had to be made

■ Study type (“field degradation, not dissipation“)

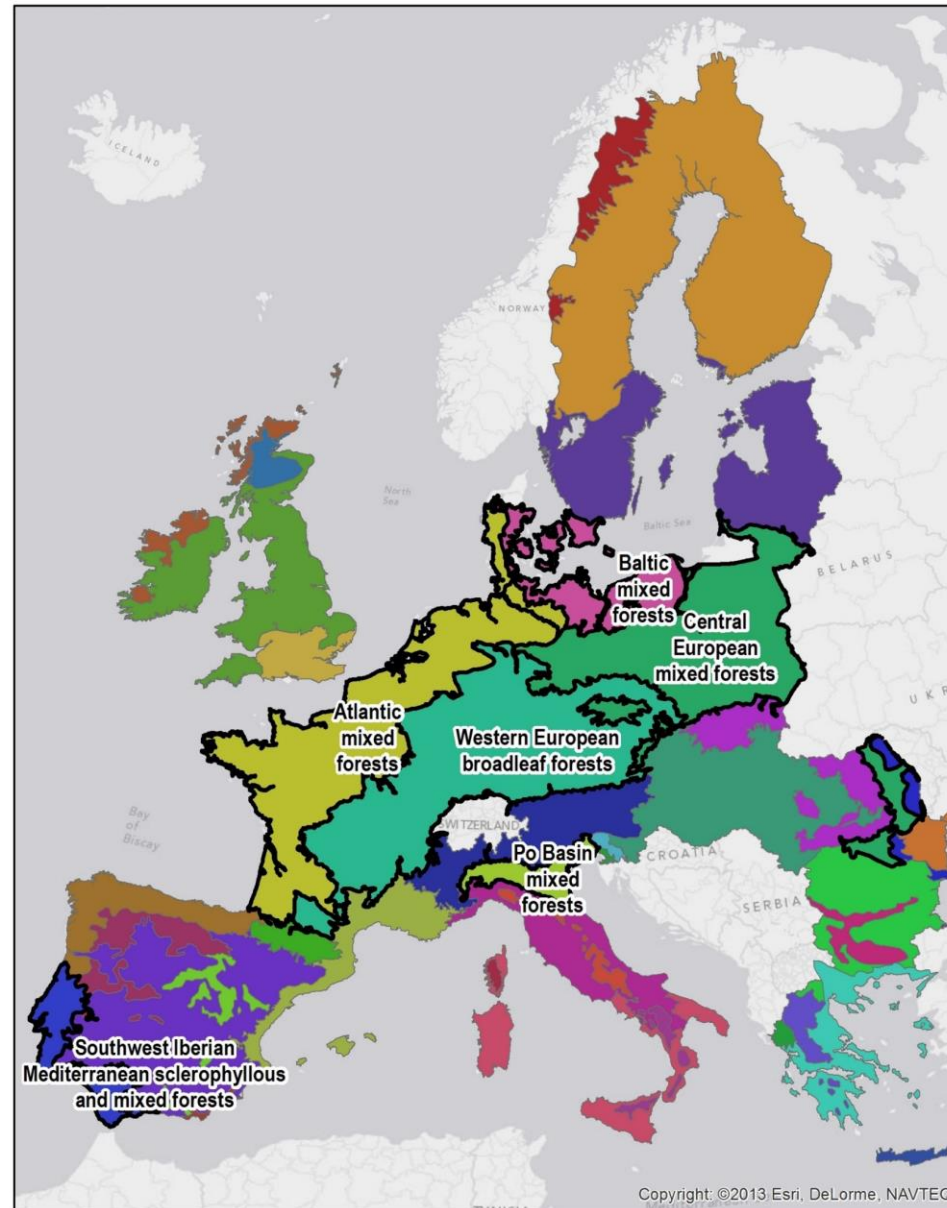
- ▶ DegT50 Submodule of OECD TFD → “terrestrial field degradation “
- ▶ Exclusion of surface loss processes by coverage with sand
- ▶ All substances applied in the same spray onto bare soil on the same field at the same time
- ▶ 3-4 replicates
- ▶ Close to GLP studies (not formally GLP)

■ Criteria for test substances

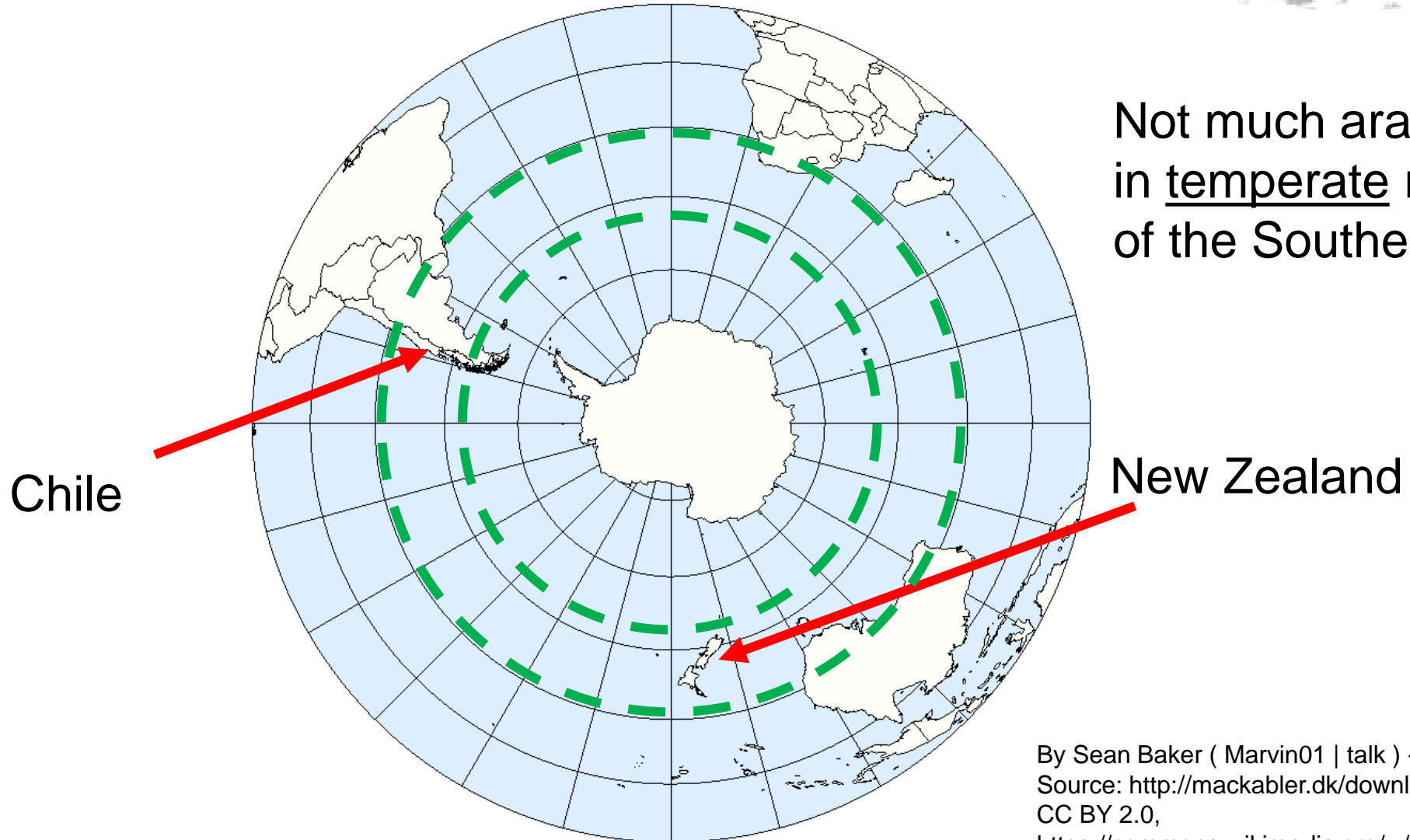
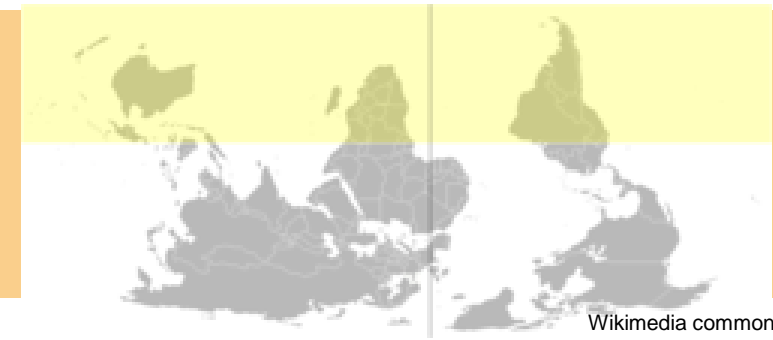
- ▶ Moderate DegT50,
8-10 sampling points, allowing kinetic evaluation of the decline curve
- ▶ not prone to leaching
- ▶ “easy” analytical methods available
- ▶ “New“ field DegT50 studies available from Europe to compare with the Southside field DegT50

Map of European Trial Sites and Ecoregions

- Ecoregion Name**
- Aegean and Western Turkey sclerophyllous and mixed forests
 - Alps conifer and mixed forests
 - Appenine deciduous montane forests
 - Atlantic mixed forests
 - Balkan mixed forests
 - Baltic mixed forests
 - Caledon conifer forests
 - Cantabrian mixed forests
 - Carpathian montane forests
 - Celtic broadleaf forests
 - Central European mixed forests
 - Corsican montane broadleaf and mixed forests
 - Crete Mediterranean forests
 - Dinaric Mountains mixed forests
 - East European forest steppe
 - English Lowlands beech forests
 - Euxine-Colchic broadleaf forests
 - Iberian conifer forests
 - Iberian sclerophyllous and semi-deciduous forests
 - Illyrian deciduous forests
 - Italian sclerophyllous and semi-deciduous forests
 - North Atlantic moist mixed forests
 - Northeastern Spain and Southern France Mediterranean forests
 - Northwest Iberian montane forests
 - Pannonian mixed forests
 - Pindus Mountains mixed forests
 - Po Basin mixed forests
 - Pontic steppe
 - Pyrenees conifer and mixed forests
 - Rodope montane mixed forests
 - Sarmatic mixed forests
 - Scandinavian Montane Birch forest and grasslands
 - Scandinavian and Russian taiga
 - South Appenine mixed montane forests
 - Southeastern Iberian shrubs and woodlands
 - Southwest Iberian Mediterranean sclerophyllous and mixed forests
 - Tyrrhenian-Adriatic Sclerophyllous and mixed forests
 - Western European broadleaf forests



Regions of Interest



Not much arable land in temperate regions of the Southern hemisphere

New Zealand (Start: September 2015)

- ▶ Soils: sand, loamy sands, loams
- ▶ OC: 1.2-1.7 %, pH_{H2O} 5.8-5.9
- ▶ T ~ 13 °C annual mean; P ~ 800 mm/year



▶ 3 sites close to Havelock (North Island) in agricultural regions

Chile (Start October 2016)

- ▶ Silt loam, loamy fine sands, clay loams
- ▶ OC: 0.7-3.4 %, pH_{H2O} 5.8-6.7
- ▶ T ~ 13 -15 °C annual mean; P~ 800 mm/year

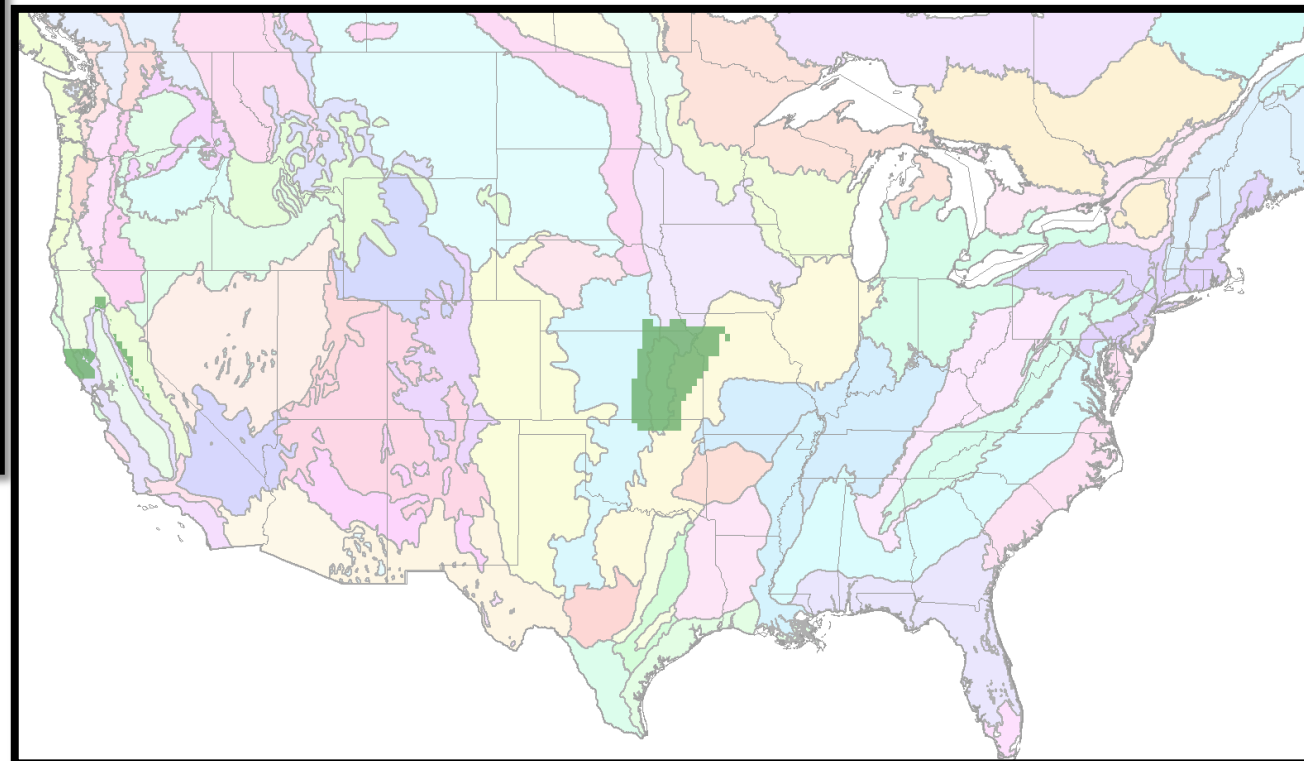
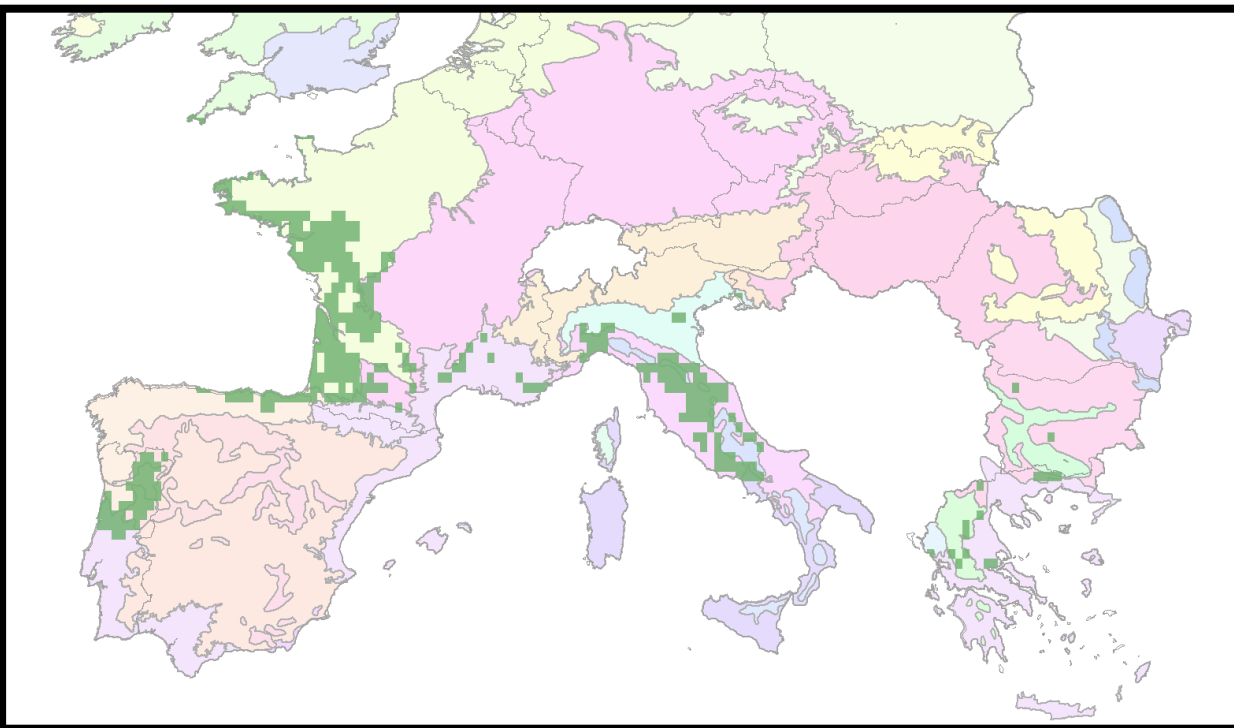


Conditions similar at the sites at the countries and similar to Southern Europe

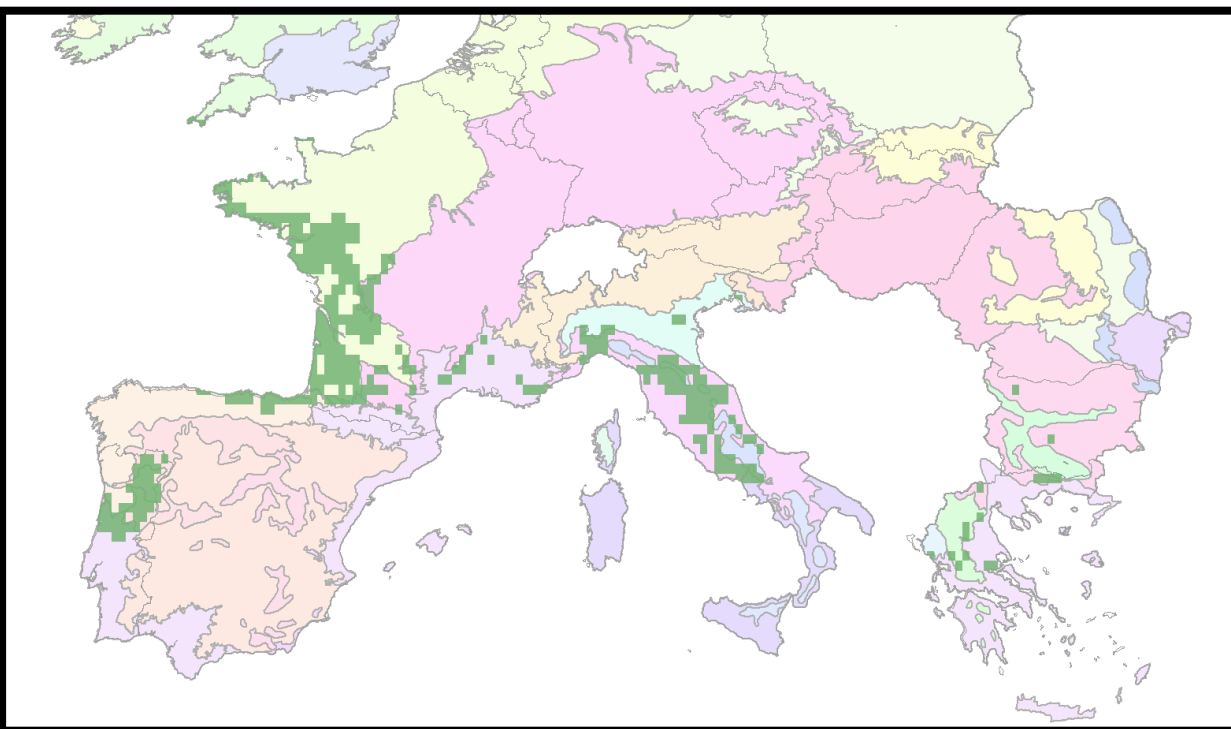


▶ 3 trial sites close to Chillán, Región del Bío-Bío east of Concepción in agricultural regions

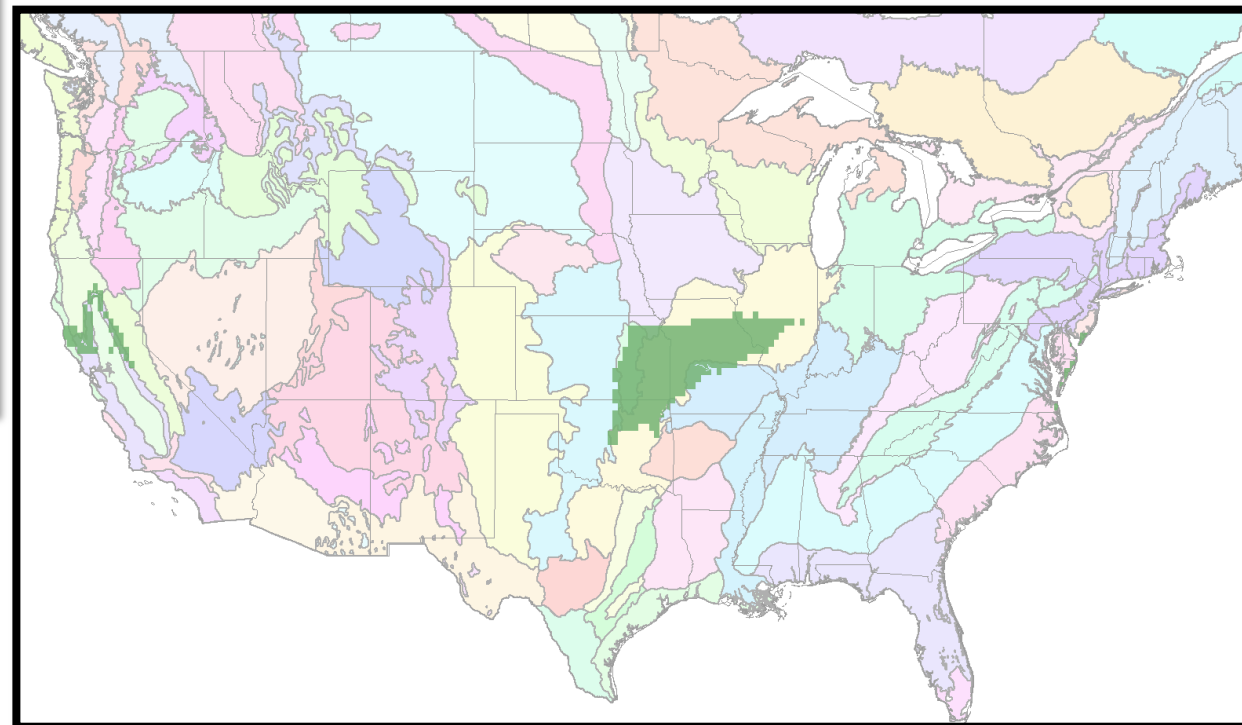
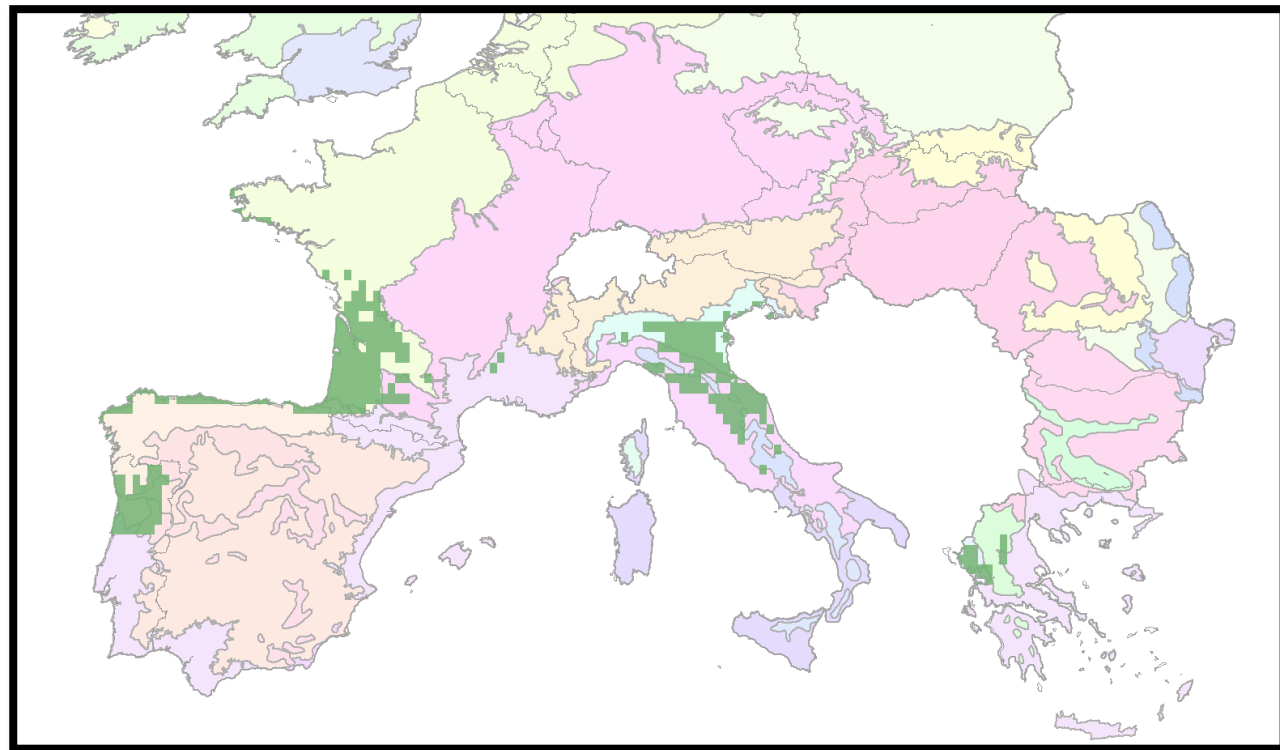
Similarity zones between sites in New Zealand and EU and NAFTA using the OECD ENASGIPS tool



Similarity zones between NZ sites and EU using the OECD ENASGIPS tool (green) and JRC-EFSA climatic and soil maps (in red)



Similarity zones between the sites in Chile and EU and NAFTA using the OECD ENASGIPS tool



New Zealand (September 2015) application, sand cover and soil sampling



Irrigation (some in NZ, more heavy in Chile) and fencing (to “exclude” animals)



Weather Data (incl. irrigation) New Zealand vs Chile



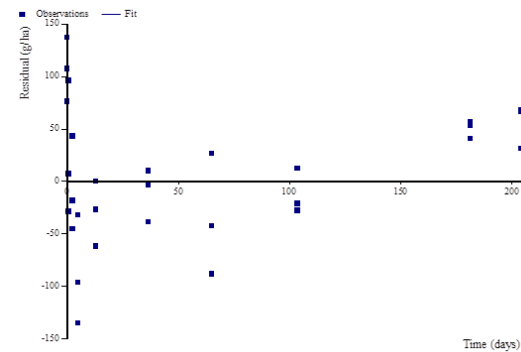
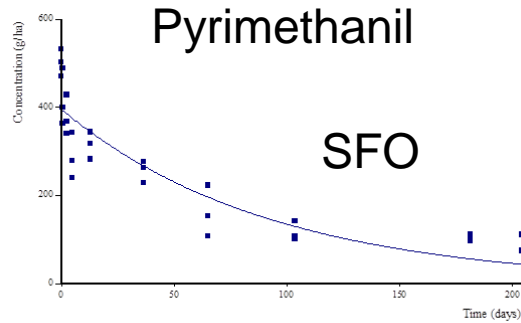
	New Zealand				Chile		
	trial 1	trial 2	trial 3		trial 1	trial 2	trial 3
application date	06.11.2015	09.09.2015	10.09.2015		08.10.2016	06.10.2016	05.10.2016
study period [d]	210	212	208		209	210	210
Air temperature over study period							
average [°C]	15.3	15.8	14.5		16.8	16.3	17.3
Precipitation / Irrigation							
precipitation [mm]	253	530	401		188	293	170
irrigation [mm]	205	85	135		408	396	402
sum over study period [mm]	458	615	536		596	689	572

Normalization and Kinetic Evaluation

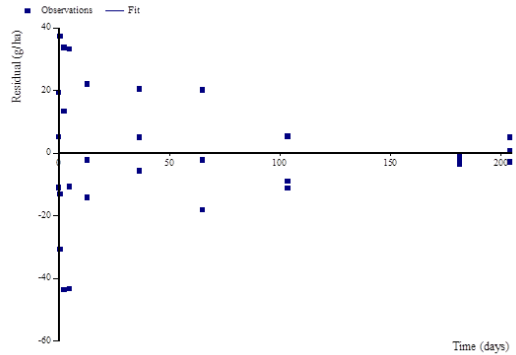
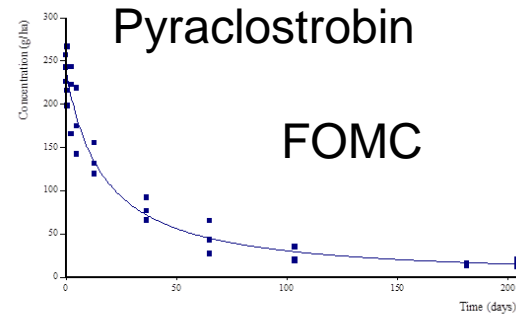
- 3 Sites with 3-4 replicates per site
- Estimation of soil temperature and soil moisture using the local weather data with PEARL model (as had been done with the EU studies)
- Establishment of the day length corrected decline curve (Normalization to reference conditions 20 °C, moisture pF2)
- Kinetic evaluation of the day length corrected decline curve with Cake
 - ▶ Optimizer: IRLS
 - ▶ DegT50:
 - SFO: = SFO DegT50
 - DFOP: $\text{DegT50} = \ln 2 / k_{\text{slow phase}}$ *
 - FOMC: $\text{DegT50} = \text{DT90} / 3.32$ *

* conservative estimate

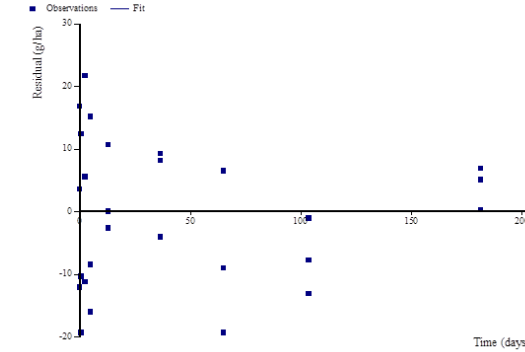
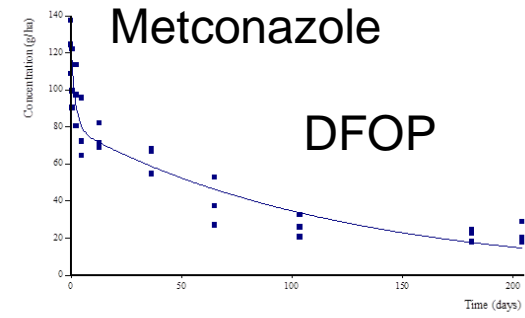
Kinetics to determine normalized DegT50 (example NZ trial site 2)



M0 [g/ha]	394.9
Norm. DT50 [d]	64.5
X ² [%]	16.0
Visual fit	acceptable

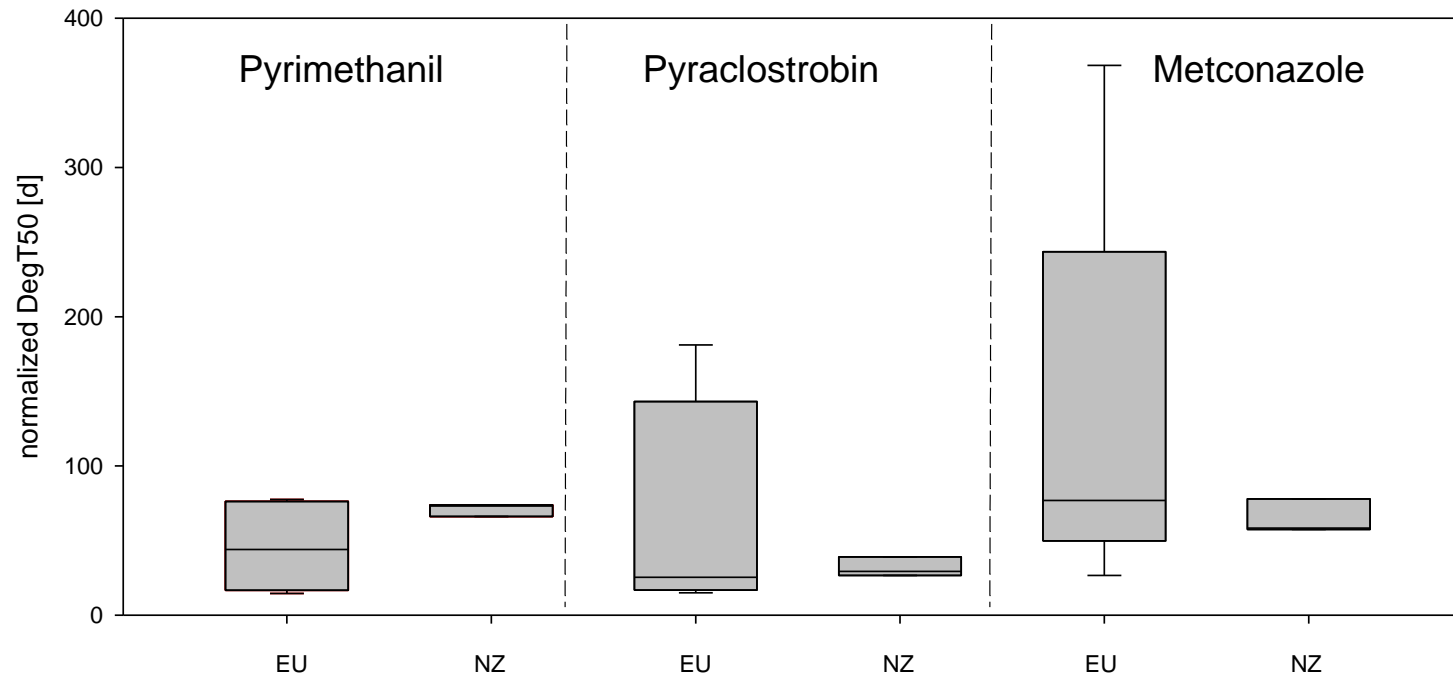


M0 [g/ha]	237.4
Norm. DT50 [d] (DT90/3.32)	39.2
X ² [%]	2.8
Visual fit	good



M0 [g/ha]	121
Norm. DT50 [d] (ln2/k2)	83.8
X ² [%]	7.3
Visual fit	acceptable

Normalized Field DegT50 EU vs. New Zealand

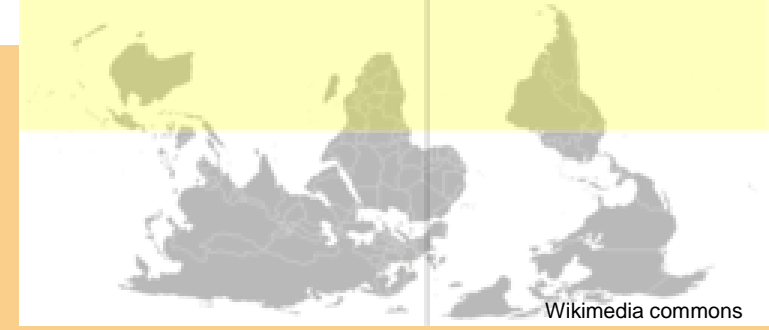


- The normalized DegT50 of the 3 pesticides from New Zealand are in the range of those from Europe
- The NZ DegT50 are not systematically in the low or in the high range of the EU DegT50
- Variation of normalised DegT50 in NZ is smaller compared to EU, however have in mind that NZ studies were conducted under more similar conditions (same time period, all in close proximity)

Normalized Field DegT50 Northern vs. Southern hemisphere

Compound	Range of DegT50 Europe [d]	Range of DegT50 New Zealand [d]	Range of DegT50 Chile [d]
Pyrimethanil	15-78	66-74	Not yet analysed
Pyraclostrobin	15-181	27-39	Not yet analysed
Metconazole	27-369	57-78	Not yet analysed

- **The normalized DegT50 of the 3 pesticides from the Southern hemisphere (New Zealand) are in the range of those from the Northern hemisphere (Europe)**



- Similar similarity zones were identified between the New Zealand and Chilean sites and EU / NAFTA using the OECD ENASGIPS tool as well as an adapted GIS crosswalk with JRC-EFSA climate and soil maps for EU.
- The principles of the OECD guidance document for conducting pesticide terrestrial field dissipation studies and the ecoregion / GIS crosswalk can be applied globally
- Field DegT50-studies conducted in the Southern hemisphere delivered similar endpoints (degradation rates in soil, normalized DegT50) as those from the Northern hemisphere.
- So far this conclusion is based on a (limited) comparison of NZ vs EU data, we are awaiting results from the Chilean trials



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