Green Islands Spring Workshop

Green Islands overview

MIT
Boston
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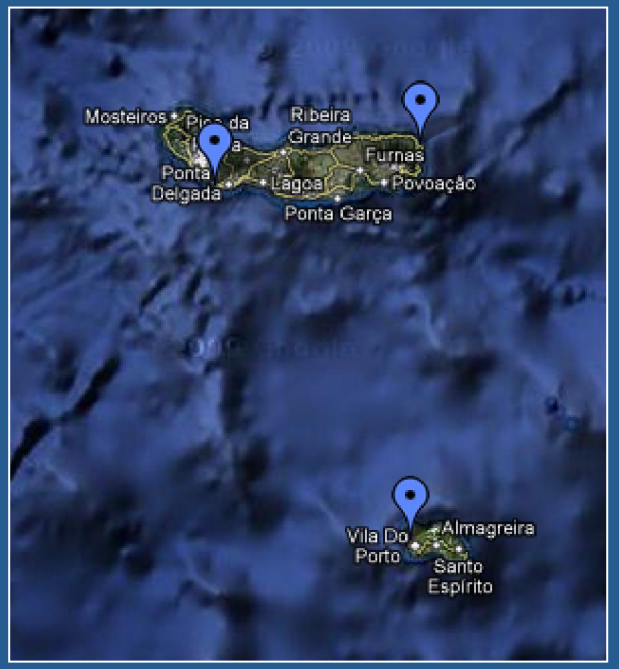
Characterization of Solar Resources in the Azores

Paulo Fialho and his team - UAç



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Pyranometers measure global radiation 0.3mm < wavelength < 3.0mm
Sampling interval < 30 seconds
Integration time = 10 minutes

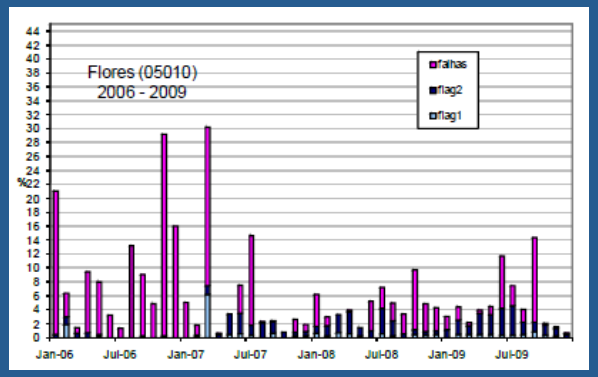
Quality control:

1 – 10 minutes sample level

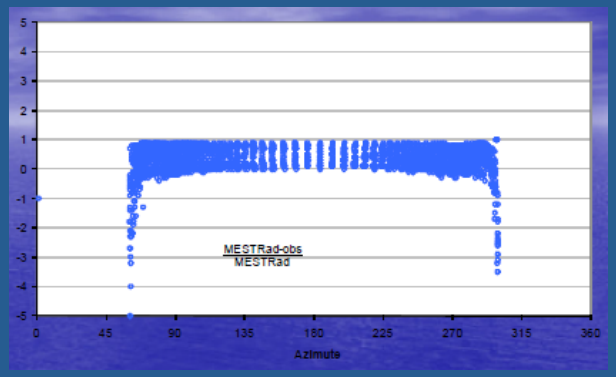
Data is marked missing (X=0), wrong ($X > 0.9*X_0$), suspicious ($0.8*X_0 < X < 0.9*X_0$).

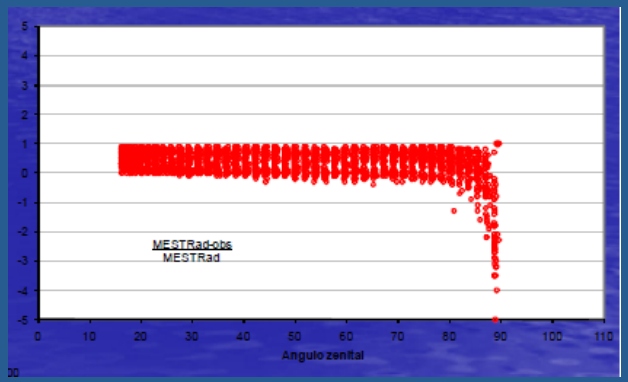
2 – Hourly data level

Hourly data is given by integration of 10 minute samples over the whole hour
Hourly value considered missing (-1) if any of the 10 minutes sample is missing
Hourly data set to zero outside sunrise-sunset interval



Missing and flagged values charts for Flores





Assess installation local efects (deviation from model MESTrad)

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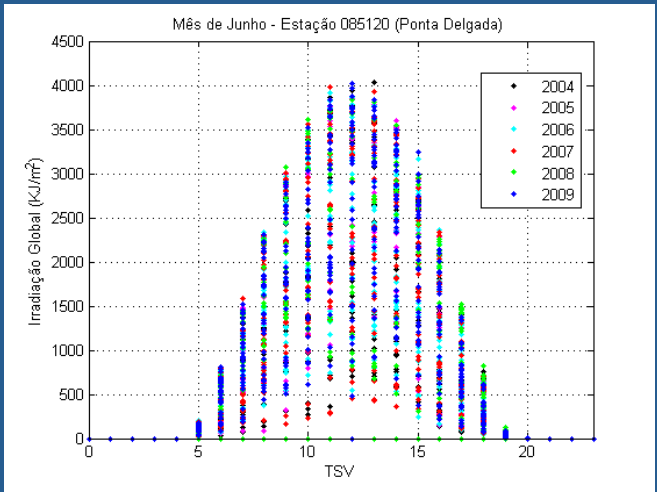
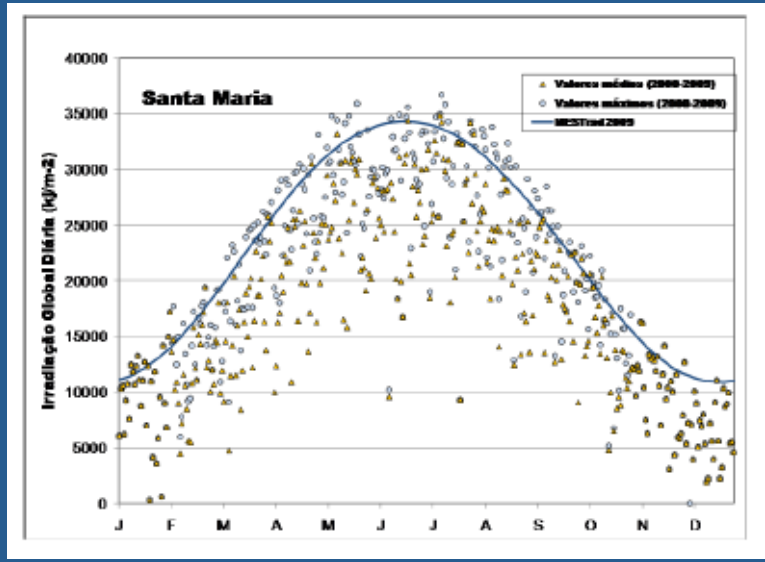
The results:



Hourly irradiation (kJ/m²) for Ponta Delgada



Daily global irradiation variability

Daily Global Irradiation values (Wh/m2)
Average, maximum, minimum and number of years
Station ID: 501
Year range: 1999 - 2009

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	1786.3	1906.1	3020.5	2860.5	3807.4	6717.3	6939.0	5956.2	4916.7	2976.5	2327.3	1698.6
	2040.7	3581.7	4259.3	3696.8	4941.5	7419.3	8648.6	7561.7	6542.2	3120.7	3627.5	2781.9
	1591.1	891.1	1493.9	1730.9	3134.1	5858.3	6143.9	4196.9	3637.6	2696.7	856.6	801.8
	5	5	4	4	4	3	4	6	4	3	5	4
02	1809.3	1845.2	2977.9	2355.5	5903.7	5073.5	6253.0	5496.7	4168.8	3607.4	1645.4	1682.4
	2301.2	2839.5	3637.4	3478.3	6486.4	7232.4	8007.9	7743.8	6514.1	4654.0	3018.5	2041.9
	1296.6	352.7	1393.1	602.3	4901.0	3546.6	3623.4	4022.1	2916.2	2770.1	331.2	1320.2
	5	3	4	4	3	3	4	5	3	4	3	4

Daily global irradiation values tables

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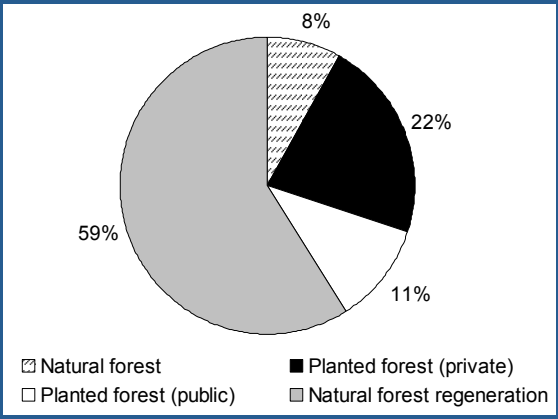
Estimation of the Potential of Woody Biomass Energy Resources in the Azores

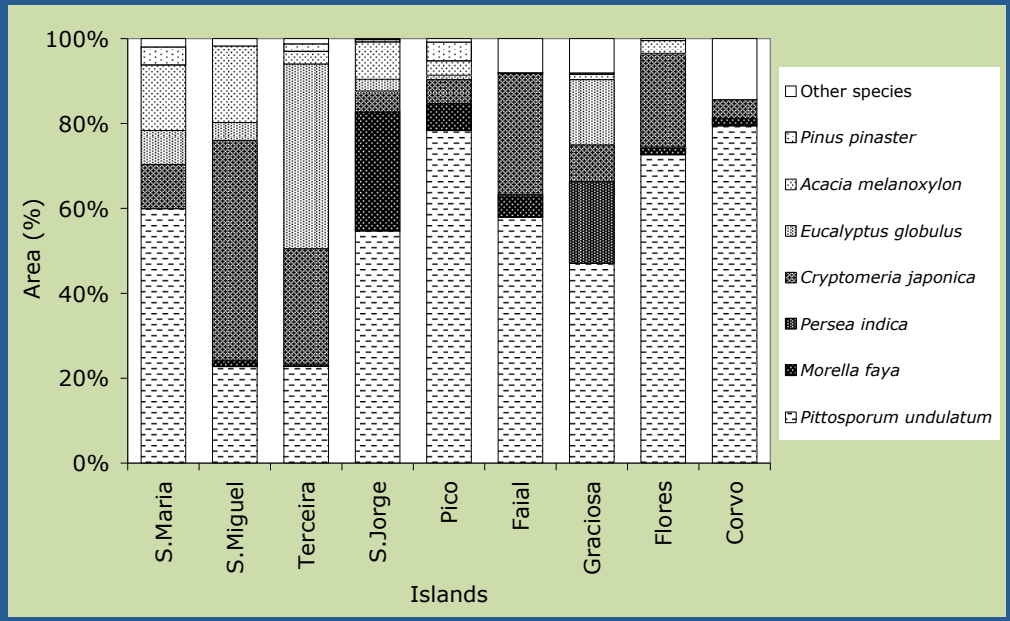
Luís Silva and his team - UAç

Gather forestry biomass data for Azores Region

- Forest stands identification and sampling
- Data analysis



Forest structure in the Azores
Source: Relatório do Estado do Ambiente, 2003



Area occupied by the dominant forest species in the Azores Islands, as a percentage of the island surface dedicated to forestry. Areas calculated using a GIS with the data from Forestry Inventory (2003-2007, DRRF)

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Gather forestry biomass data for Azores Region

- Chemical and calorimetric analysis of woody species

Specie		Moisture content (%)	Volatile matter (550ºC) (%, B.S.)	Ash content (%, B.S.)	Heating value (KCal/Kg (B.S.))	
					upper	lower
Pittosporum undulatum	Trunk (>8cm)	46	99	0.9	4095	4685
	Branches (<8cm)	47	99	1.1	4293	4867
Acacia melanoxylon	Trunk (>8cm)	47	99	1.1	4723	5189
	Branches (<8cm)	47	99	1.3	5082	5529
Persea indica	Trunk (>8cm)	56	99	1.3	3974	4723
	Branches (<8cm)	55	99	1.3	3849	4490
Morella faya	Trunk (>8cm)	47	99	1.2	4035	4569
	Branches (<8cm)	47	99	1.2	4350	4914
Platanus hybrida	Trunk (>8cm)	49	99	1.1	4180	4715
	Branches (<8cm)	49	99	1.3	4106	4602
Eucalyptus globulus	Trunk (>8cm)	56	99	1.2	4305	4832
	Branches (<8cm)	50	99	0.9	4356	4665
Cryptomeria japonica	Trunk (>8cm)	73	99	0.6	5004	5856
	Branches (<8cm)	73	99	0.6	3988	4967

Trace element analysis of P. undulatum, Acacia melanoxylon, Persea indica, Morella faya, Platanus hybrida, Eucalyptus globolus and Cryptomeria japonica

- Calorific power and ash content of analyzed woods were in the expected range for similar materials;
- Higher water content for *C. japonica*, *E.globulus* and *P. indica*;
- Higher calorific power for *C. japonica* and *A. molanoxylon;*
- Amount of possible contaminants relatively low (table not shown).

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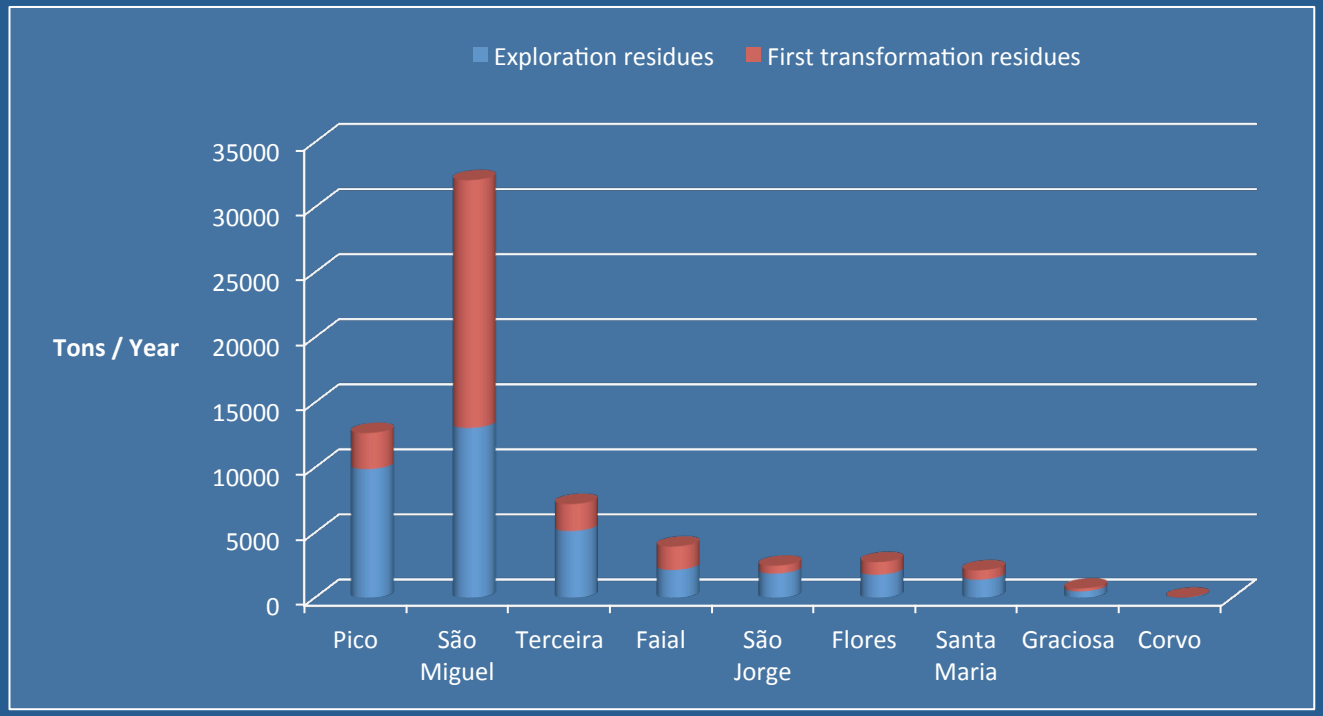
Gather forestry biomass data for Azores Region



Biomass availability for each island

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Azores Mobility Survey and Potential for Carpooling and Car Sharing

Isabel Estrela Rego, Regina Cunha and her team - UAç

- **Goal**: establish the present day characteristics of Azorean mobility;
- Preliminary survey to test final survey structure (due to lack of previous data);
- Population divided in segments covering whole island population;
- Municipalities were used as territorial units ;
- 100 respondents for the pilot survey (6 municipalities).

Extract results from pilot survey data

Households

- 4% of households have motorbikes
- 49% of households have bicycle

- 40% have one car
- 37% have 2 cars
- 9% have no car at all

Respondents

- Majority are between 20 and 55 years old
- 68% are female
- ~ 80% employed full time
- 43% with college education
- 11% completed high-school

- > 80% hade incomes lower than 2000€/month
- ~ 30% between 1000€ and 2000€ /month

- 83% have driver license (54% of these are car owners)
- Most have free street parking space

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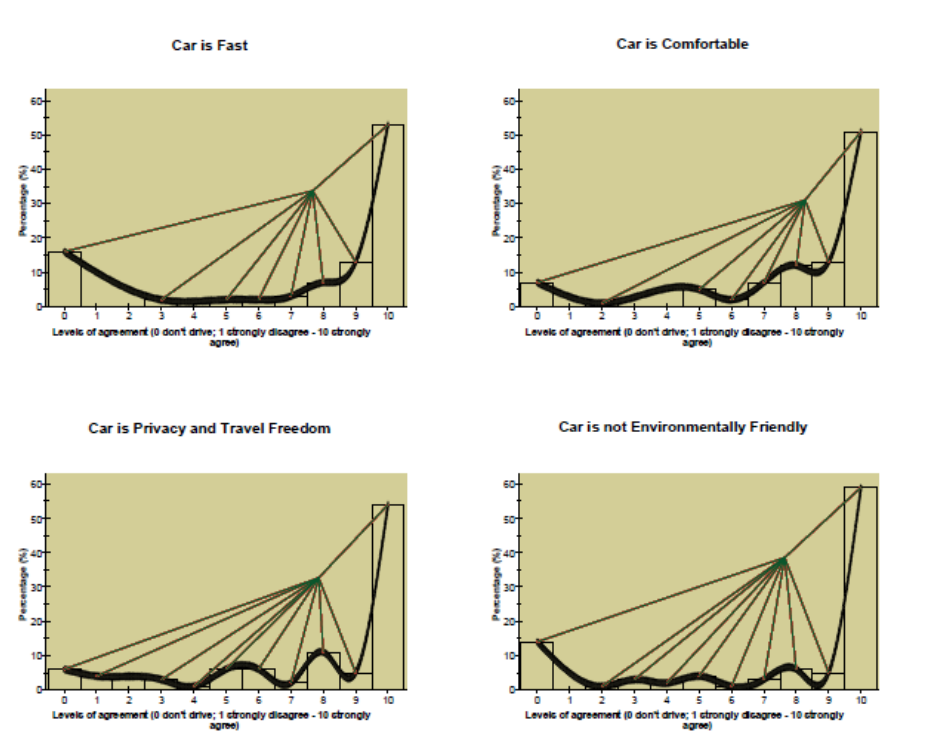

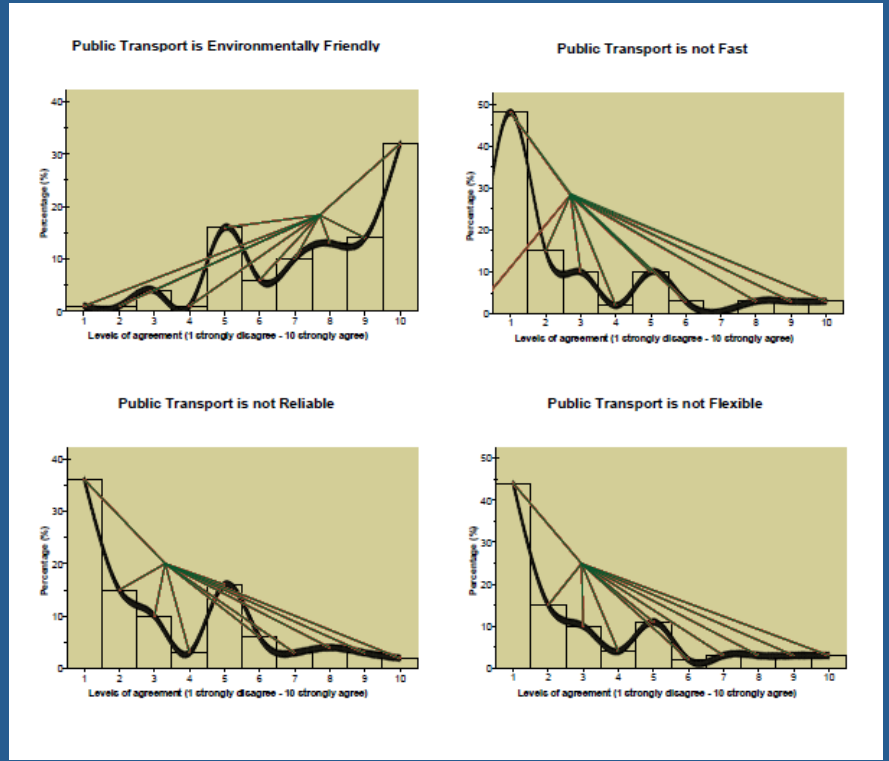

Commuting distance:
Average = 9.7 km — More than 50% below 5 km

Commuting time:
Average = 18 minutes — More than 50% below 10 minutes

Private car 68% (driver 59%, passenger9%)
Public transport 8%

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Generations of Azoreans and Renewable Energy

Rosa Simas and her team - UAç

GenARE

Comparative study of the perspectives, ideas and habits of three generations regarding energy issues (enquiry phase)

- Grandparents
- Parents
- Children

Results statements:

Concepts

- Anthropocentric view stronger than biocentric
- Few families adhered to day/night electricity rates (don't think it is usefull)
- People (wrongly) think that the utility with higher cost is electricity. Findings show it is butane gas

Perceptions

- All three generations seem to believe that energy use will continue to rise
- Most people think it is politician's responsibility to solve environmental problems, but they show lack of confidence on them

Generations

- Older generation (grandparents) are less willing to pay the higher price of renewable energies than younger generations
- All three generations agree that TV is their main information source. Younger generation don't look at Internet as an information source
- All three generations show misconceptions about energy issues, particularly energy sources and energy efficiency

Practices

- The most referred practices to help saving energy are related to lighting → Turn off when not needed and replace old bulbs
- In general, people seem to be receptive to changing habits and practices towards energy saving, but they don't show willingness to pay for the eventual overcost.

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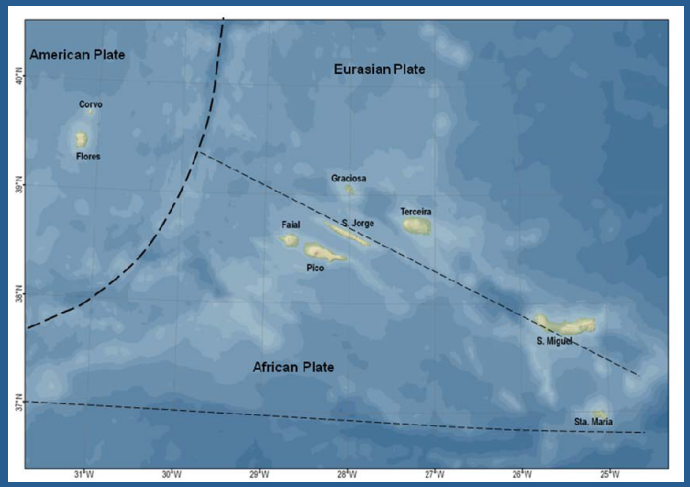
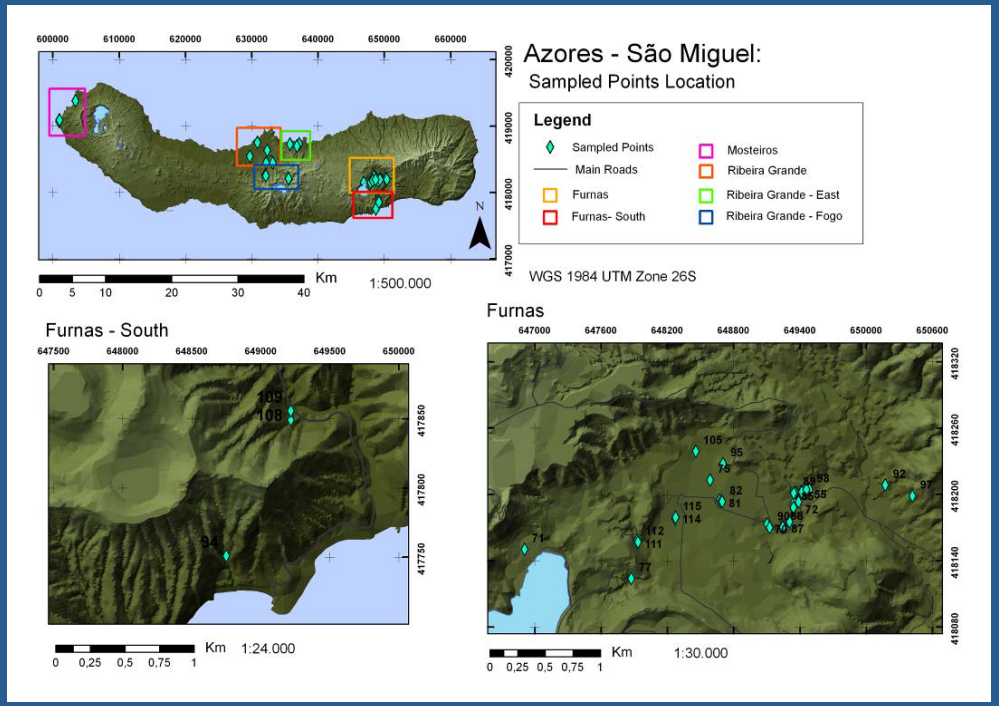
Characterization of Geothermal Energy in the Azores

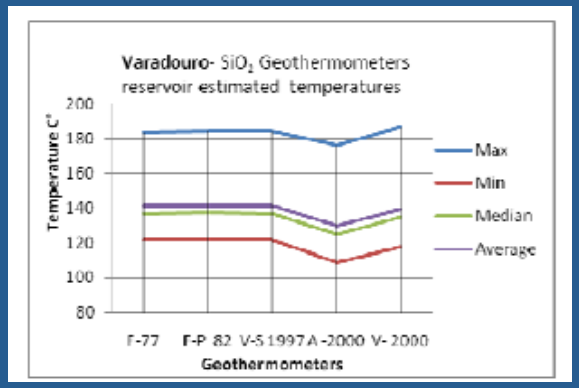
Rui Coutinho and his team - UAç



Azores Triple Junction



Sampled 92 mineral water sources , in 7 islands



Temperature Distribution Modeling

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The Potential of Whey Biomass as Energy Feedstock in Azores

José Matos and his team - UAç

Goal: Study the methodologies to be implemented to give use to lactose from Azorean cheese whey

Project tasks:

- Assess volume of whey produced (estimated from cheese production data)
- Determine chemical composition of whey
- Determine whey physical properties
- Identify best products to be obtained from an energetic and carbon balance point of view
- Environmental impact of whey
- Identification of the best end use products to obtain from whey
- Environmentally and economically sound uses of whey

→

Yeast
Ethyl alcohol
Biogas (H_2 and methane)
Lactic Acid and Lactates
Whey fermented beverages
Non-alcoholic beverages
Alcoholic beverages
Sub products for food and pharmaceutical industry
Whey protein

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The Potential of Whey Biomass as Energy Feedstock in Azores

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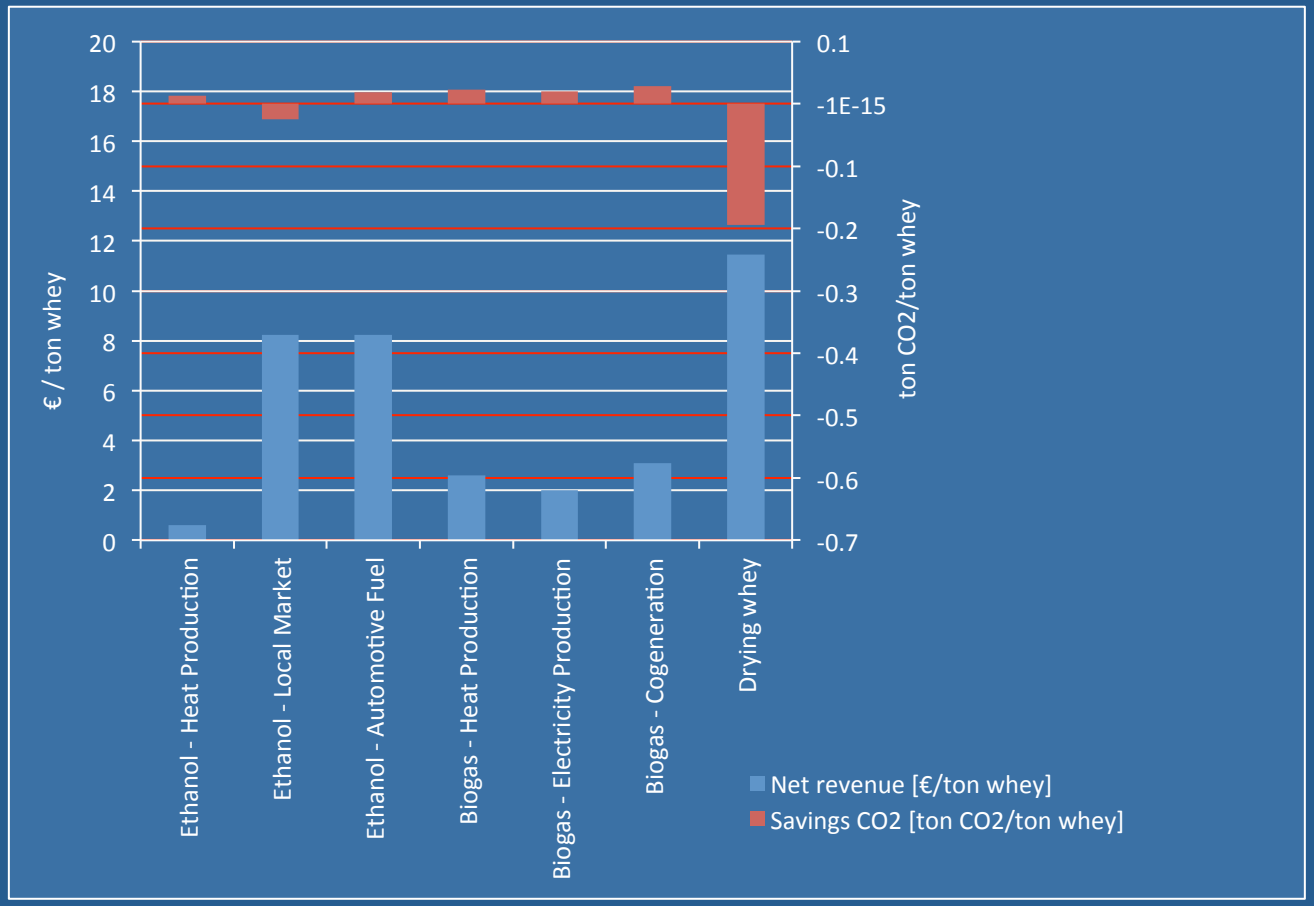

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For more information about the Green Islands groups results, please visit http://green-islands-azores.uac.pt

If you're looking for something you can't find, please let me know:

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Thank you.