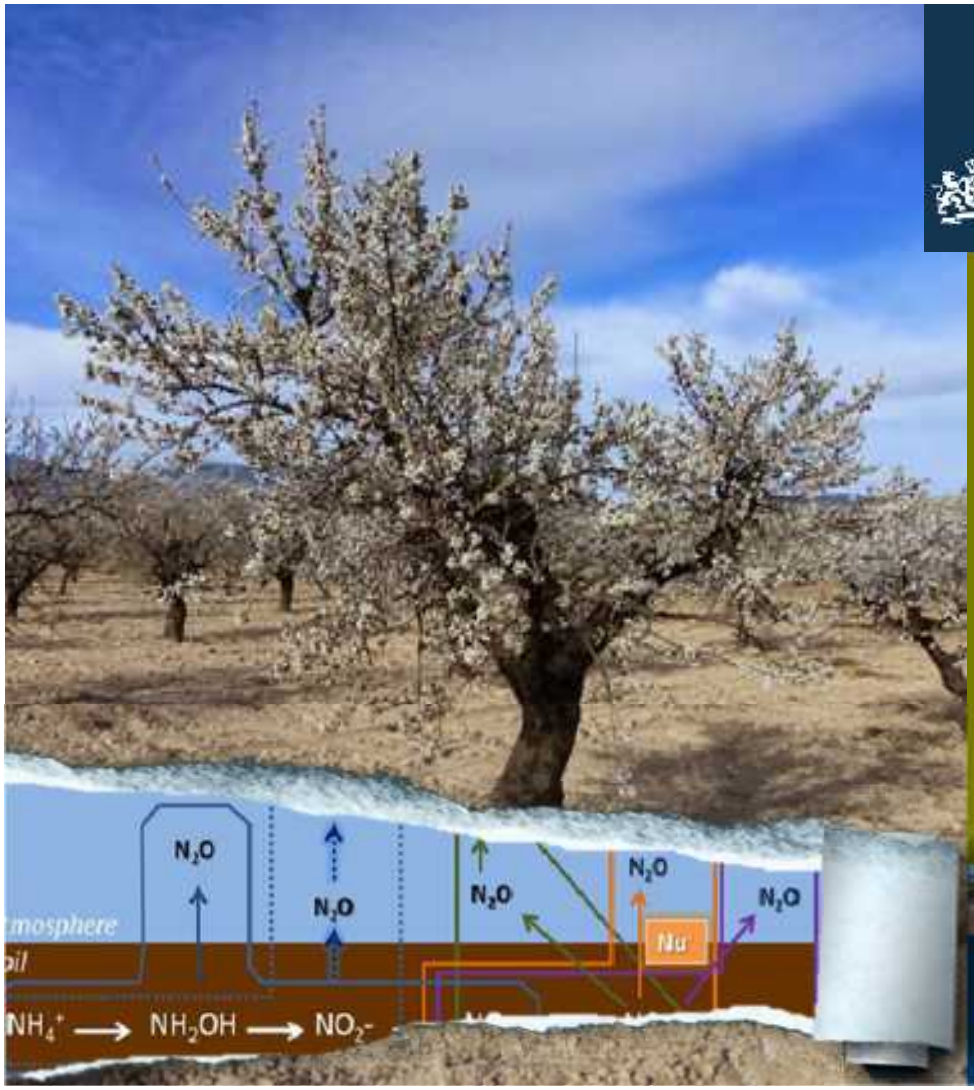

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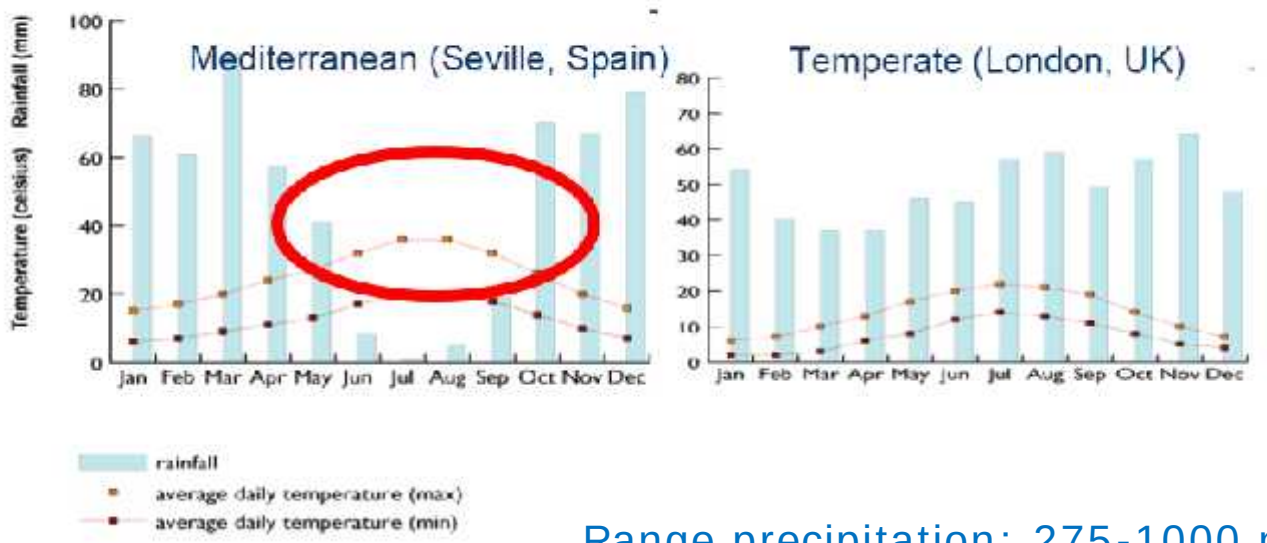
Nitrous oxide emission factors across Mediterranean regions: a meta-analysis of available data from field studies

M.L. Cayuela, E. Aguilera, A. Sanz-Cobena, D.C. Adams, D.A., L. Barton, R. Ryals, W. L. Silver, M.A. Alfaro, V.A. Pappa, P. Smith, J. Garnier, G. Billen, L. Bouwman, A. Bondeau, L. Lassaletta

Mediterranean type climate

Dry, hot summers and mild winters characterize Mediterrranean climate



Range precipitation: 275-1000 mm

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Mediterranean type climate areas worldwide

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Why should we consider a different EF forMediterranean regions?

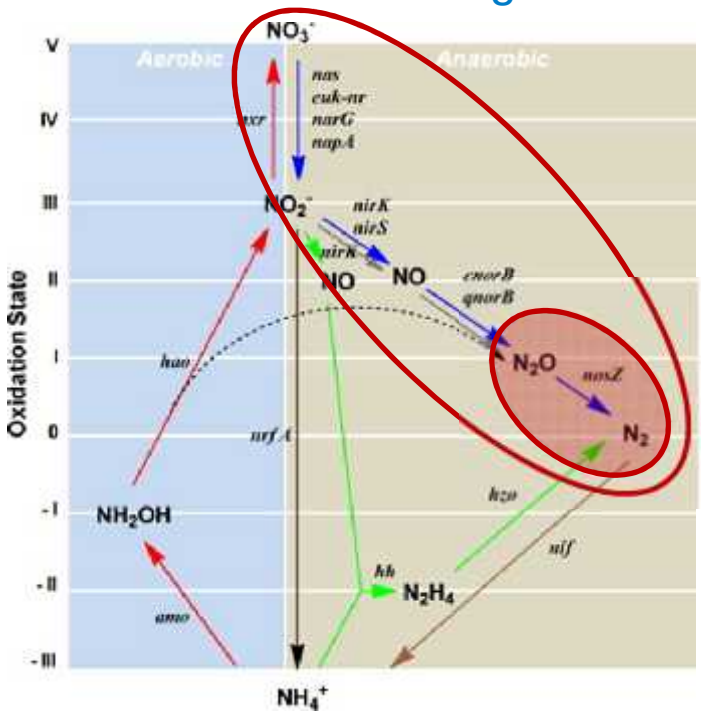
1. Summers are dry.

Effect on N2O emissions?

Why should we consider a different EF forMediterranean regions?

1. Summers are dry.

2. Soils have a high pH and low concentration of organic matter.



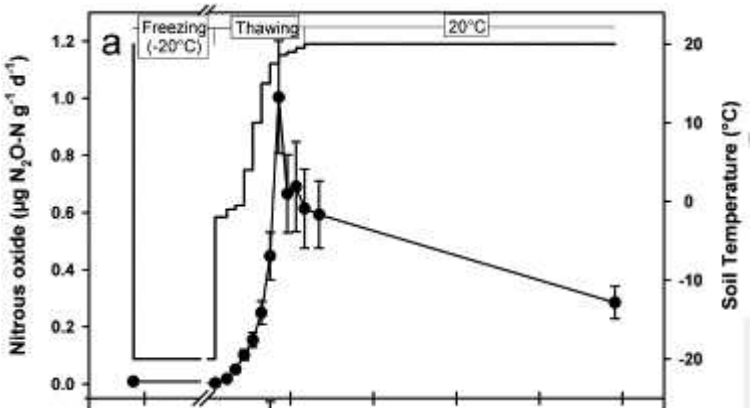
Pauleta et al., 2013 Coordination Chemistry Reviews

Why should we consider a different EF forMediterranean regions?

1. Summers are dry.

2. Soils have a high pH and low concentration of organic matter.

3. Winters are mild (rarely exposed to freeze-thaw cycles)



(Muller et al., 2002; Soil Biology & Biochemistry)

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Objectives

1. Synthesize available field data of soil N_2O emisions from Mediterranean cropping systems

2. Propose (using meta-analysis) a more robust and reliable regional Emission Factors (EF)

3. Identify the factors (soil type, water management, fertilization) controlling EF in Mediterranean crops.

Systematic review

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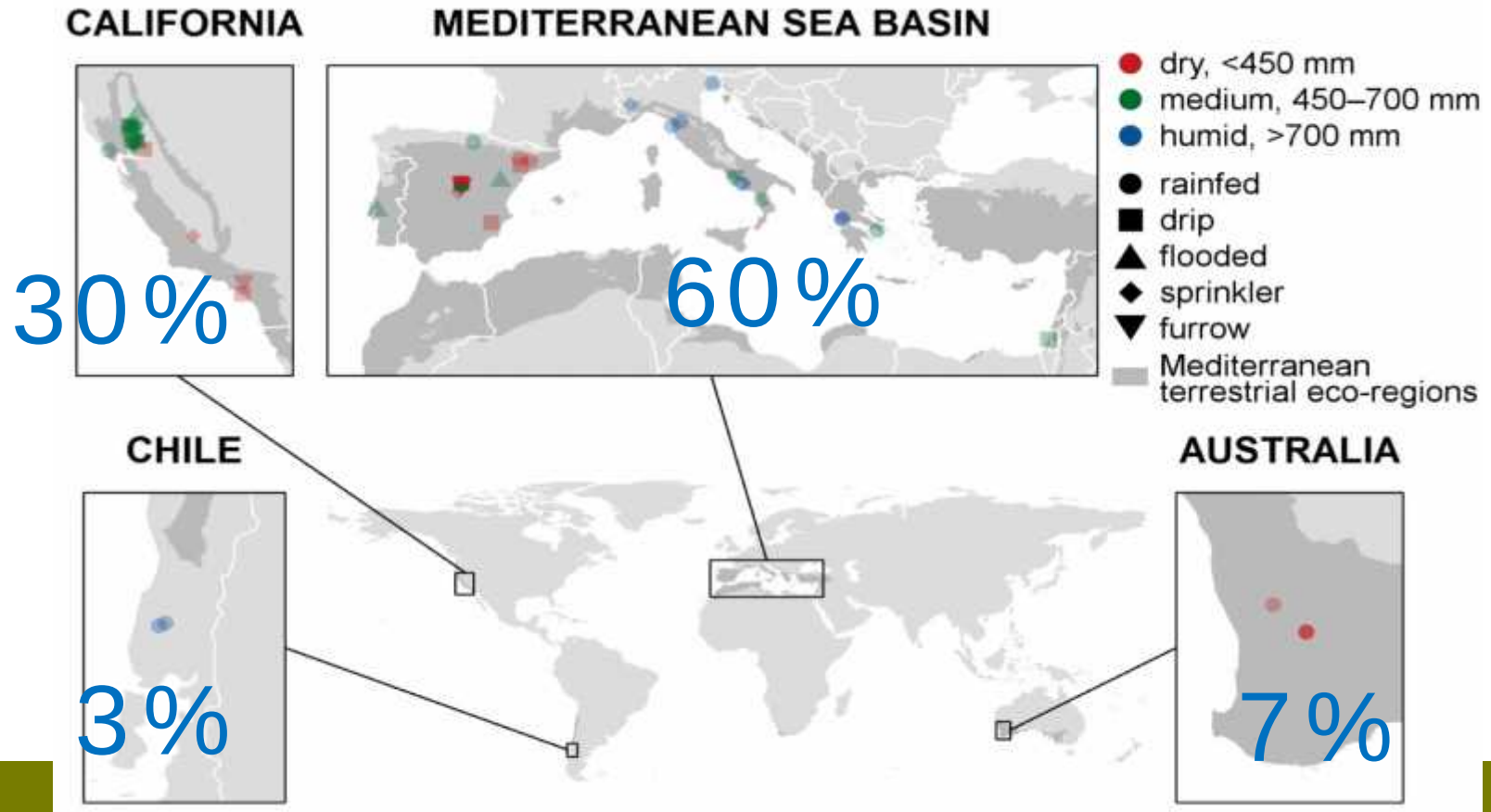

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Meta-analysis methodology

EFFECT SIZE = $(\%) = \frac{\cdot \quad - \cdot}{\cdot} *$

Grouped effect sizes were calculated using a categorical random effects model (Adams et al. 1997)

MetaWin Version 2 Statistical software (Rosenberg et al., 2000)

Adams et al. (1997). Ecology
Rosemberg et al. (2000) MetaWin: Statistical Software for Meta-Analysis. Version 2.0

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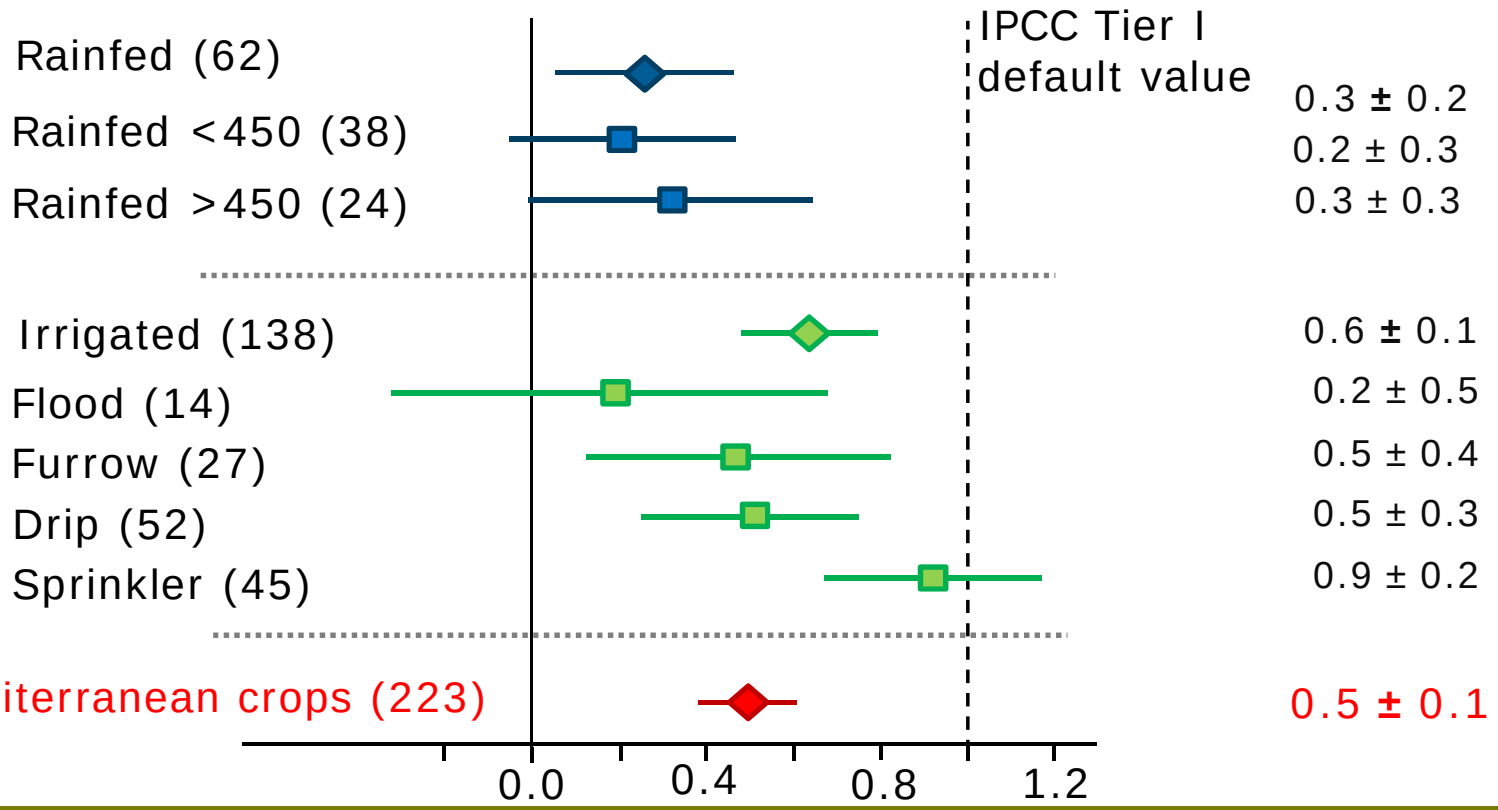
Results:

Water management



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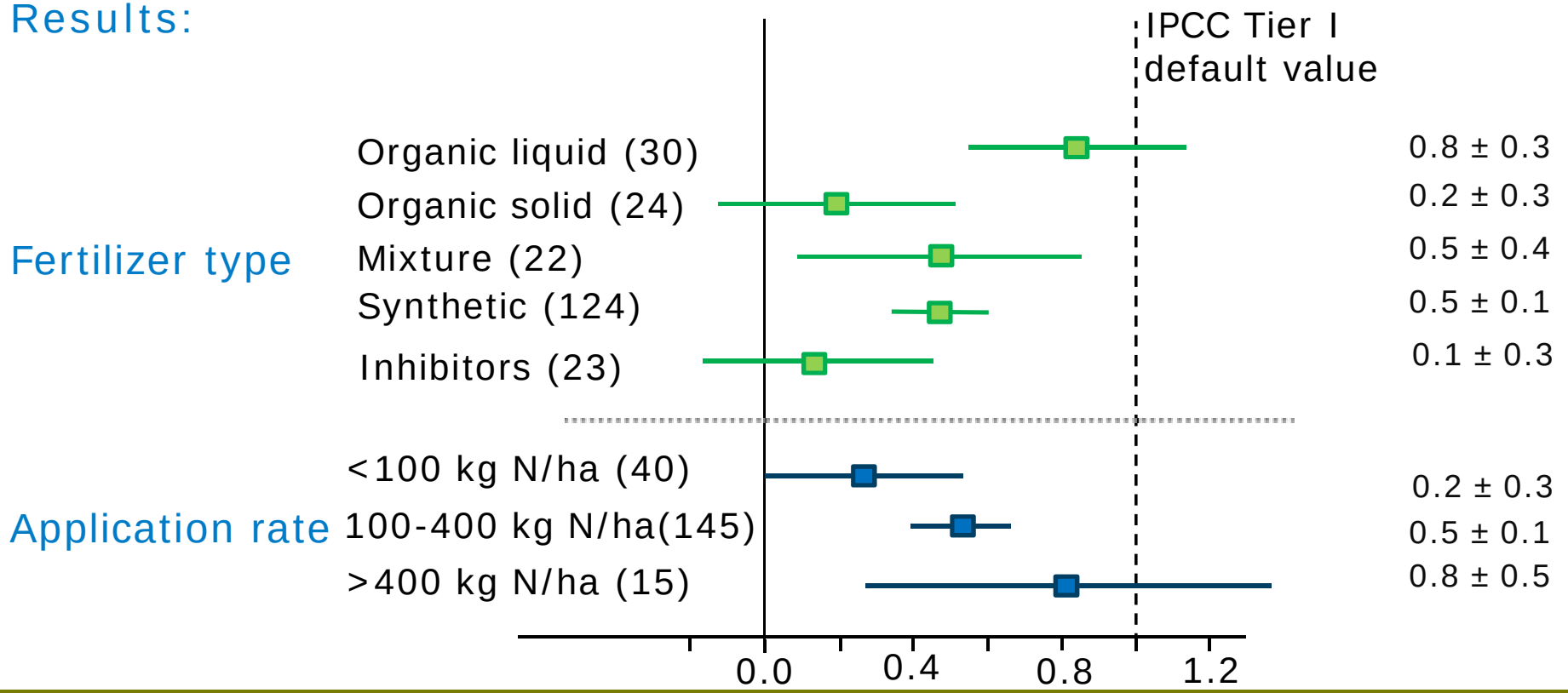
Results:



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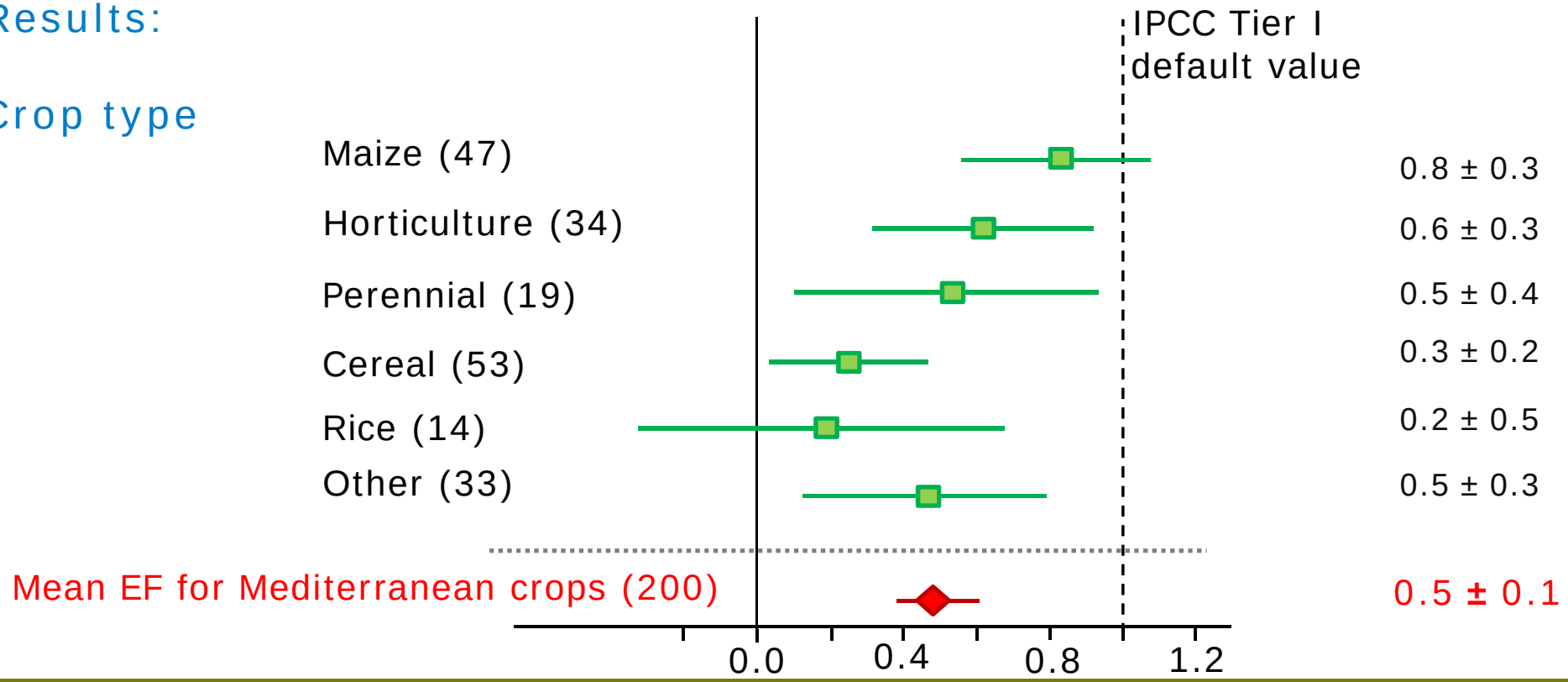
Results:

Crop type



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Case study: effect of EF choice on the estimation of Spanish N_2O emissions

	EFs	Temperate climate	Mediterranean climate
Current	Rain-fed crops	1.0%	1.0%
	Irrigated crops	1.0%	1.0%
New EFs	Rain-fed crops	1.0%	0.27%
	Irrigated furrow (27% surf.)	1.0%	0.47%
	Sprinkler (24% surface)	1.0%	0.91%
	Drip (49% surface)	1.0%	0.51%

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Case study: effect of EF choice on the estimation of Spanish N_2O emissions

		Temperate climate	Mediterranean climate	Total
Fertilizer N input (synth + org) (Gg N yr^{-1})	Rain-fed crops	137	585	722
	Irrigated crops	13	664	678
	Total	151	1249	1400
Current EFs	Rain-fed crops	1.4	5.8	7.2
Total N_2O emissions	Irrigated crops	0.1	6.6	6.8
(Gg N yr^{-1})	Total	1.5	12.5	14.0
	Rain-fed crops	1.4	1.6	3.0
New EFs	Furrow (27%)	0.0	0.8	0.9
Total N_2O emissions	Sprinkler (24%)	0.0	1.5	1.5
(Gg N yr^{-1})	Drip (49%)	0.1	1.7	1.7
	Total	1.5	5.5	7.0

50% lower

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Concluding remarks and future research needs

EF (Mediterranean) < IPCC default value

More field studies are needed:

- Many crops are absent or under-represented
- Measuring emissions for a whole year
- Including controls without fertilizers
- Large areas unexplored (specially in Africa)

- Water input and management are key drivers

- Fertilizer type and dose also affect

Special Issue: *Mitigation and quantification of greenhouse gas emissions in Mediterranean cropping systems*

Alberto Sanz-Cobena, Luis Lassaletta, Josette Garnier & Pete Smith (Eds.)

Agriculture, Ecosystem & Environment (Dec -2016)

14 contributions about GHG mitigation in Mediterranean crops

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Thank you

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