

Measures and experiences for accounting the sequestration of CO₂ by Alpine forests

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THE ALPINE CONVENTION IS THE FIRST INTERNATIONAL TREATY FOR THE PROTECTION AND PROMOTION OF THE SUSTAINABLE DEVELOPMENT OF A CROSS-BORDER MOUNTAINOUS REGION
italian presidency 2013-2014
alpine convention



MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

02 2003

- ❖ **Mountain forests in Italy: overview from the NFI**
- ❖ **Initiative for accounting CO₂ sequestration in the Alps - Italy**
- ❖ **Possible help from research and monitoring**
- ❖ **Concluding remarks**

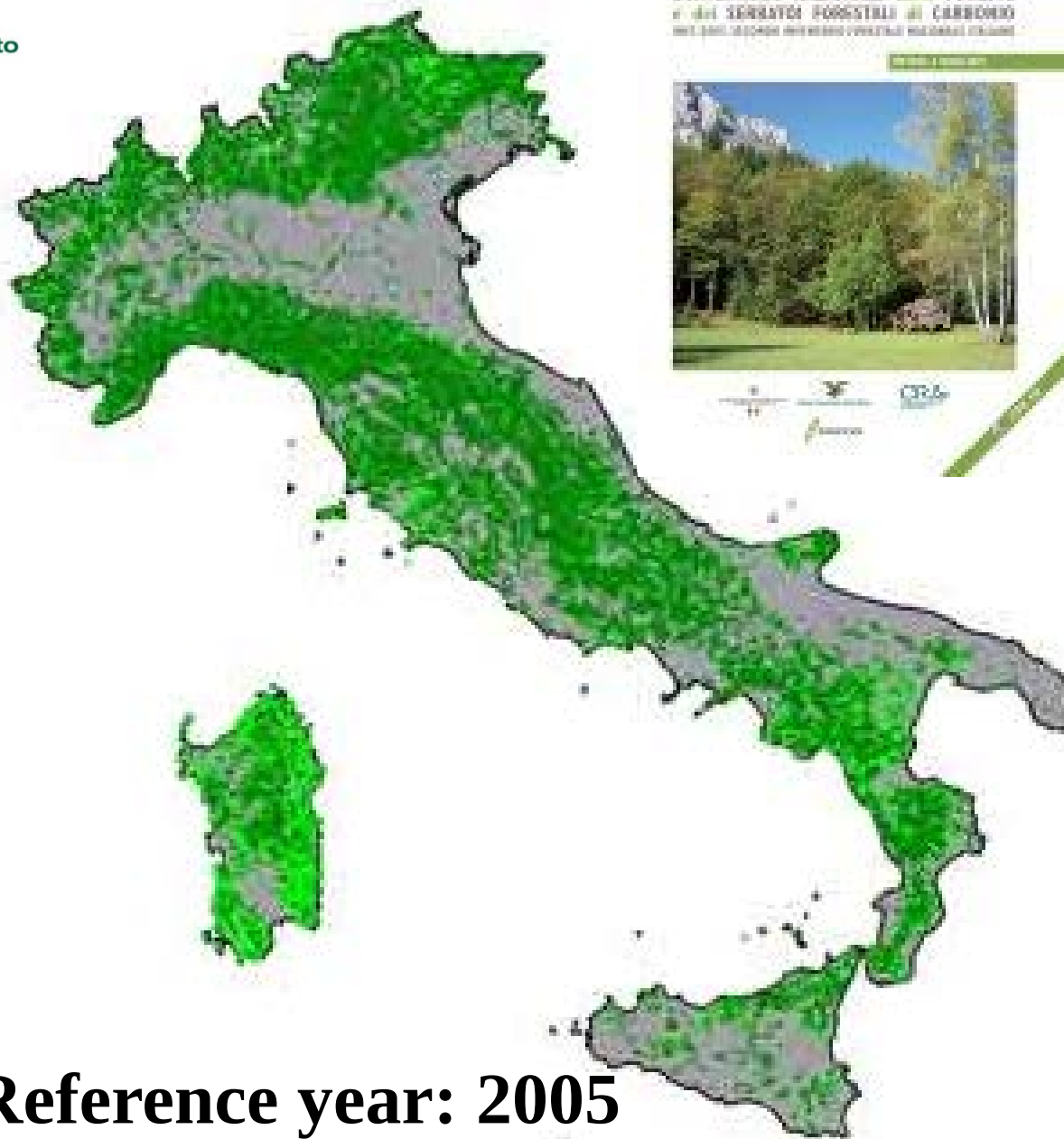


Mountain forests in Italy: overview from the NFI





Corpo Forestale dello Stato



Reference year: 2005

Mountain forests in Italy: area

	Italy	Mountain (above 900 m)	% in mountain
	Mha	Mha	%
Forest	8,759,200	3,042,276	34.7
Other woodlands	1,708,333	274,508	16.1
Total	10,467,533	3,316,784	31.7

~ 35% of italian forests (~ 32% in total)

<http://www.sian.it/inventarioforestale/>
<http://www.infc.it>
Tabacchi et al., 2012



Mountain forests in Italy: percentage in Regions

		Forest	Other woodlands
Alps	Alto Adige	90.7	87.4
	Valle d'Aosta	88.6	45.7
	Trentino	77.2	80.9
	Veneto	54.2	46.8
	Lombardia	44.0	56.3
	Piemonte	41.4	50.2
	Friuli V.G.	40.4	53.0

Apennines	Abruzzo	57.0	46.2
	Calabria	46.1	7.0
	Basilicata	35.0	12.8

Sicilia	31.1	15.1
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Italy	34.7	16.1
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Mountain forests in Italy: biomass and growth

Tree species	Aboveground Wood Biomass		Growth	
	Mg	Mg ha ⁻¹	m ³	m ³ ha ⁻¹
Larch and stone pine	41,560,488	108.7	1,282,925	3.36
Norway spruce	113,574,186	193.8	4,567,710	7.79
Fir	15,776,163	230.4	565,119	8.25
Scots and Mountain pine	16,844,819	111.1	529,251	3.49
Austrian and Calabrian pine	29,645,581	125.4	1,404,011	5.94
Beech	183,976,744	177.7	5,597,810	5.41
Italian total	866,731,507	101.0	34,885,362	4.06
Percentage of italian total	46.3	156.3	40.0	140.6

Biomass rich and productive forests!!

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Tabacchi et al., 2012



Initiative for accounting CO₂ sequestration in the Alps - Italy



Regional forest inventories



Trentino: Forest inventory focusing on Carbon



The IN.EM.AR initiatives (Lombardy and Piemonte)



Agenzia Regionale
per la Protezione dell'Ambiente
della Lombardia

L'inventario degli assorbimenti e delle emissioni dal settore forestale in IN.EM.AR

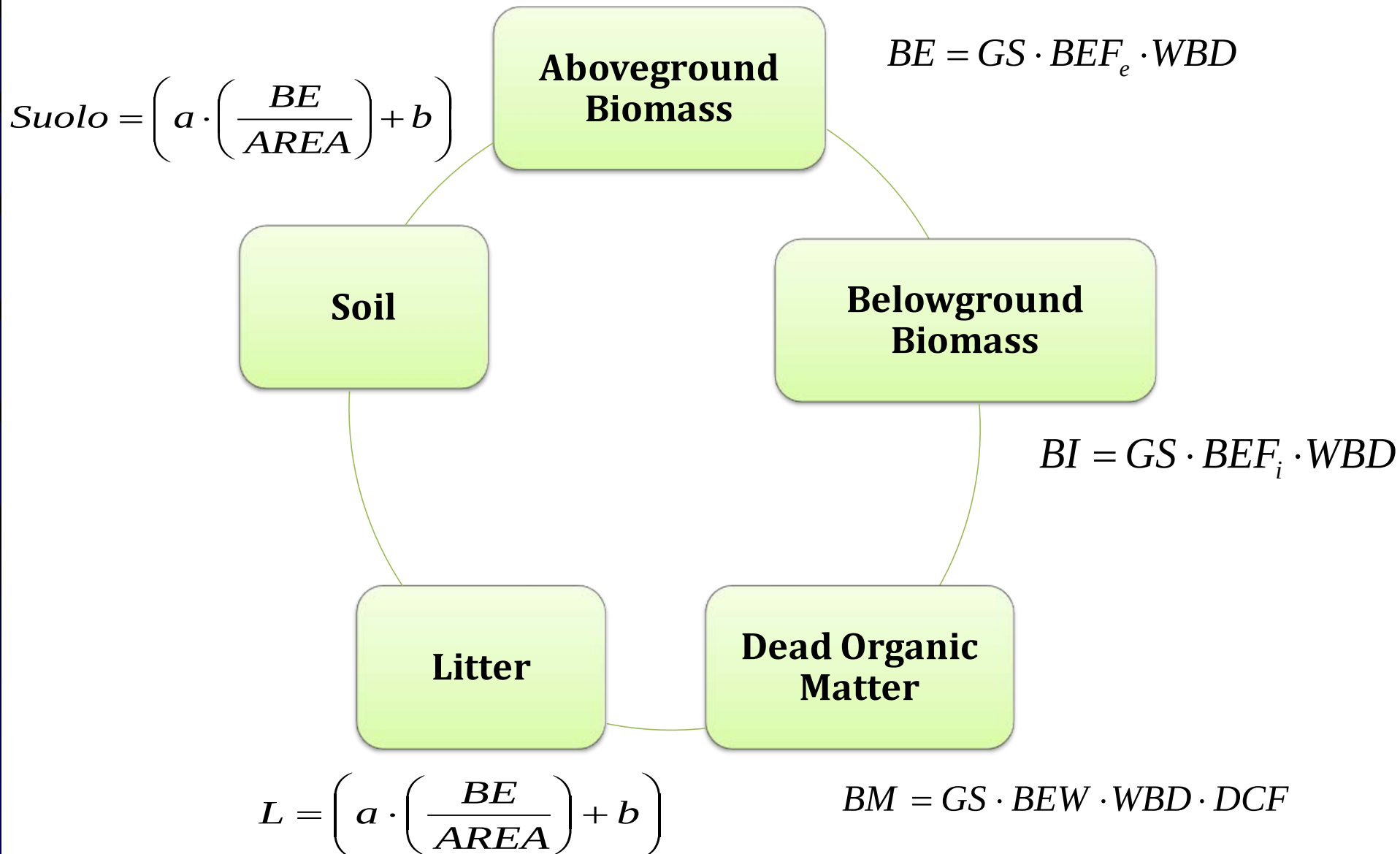
Metodologia, dati disponibili e risultati

Ing. Antognazza Federico

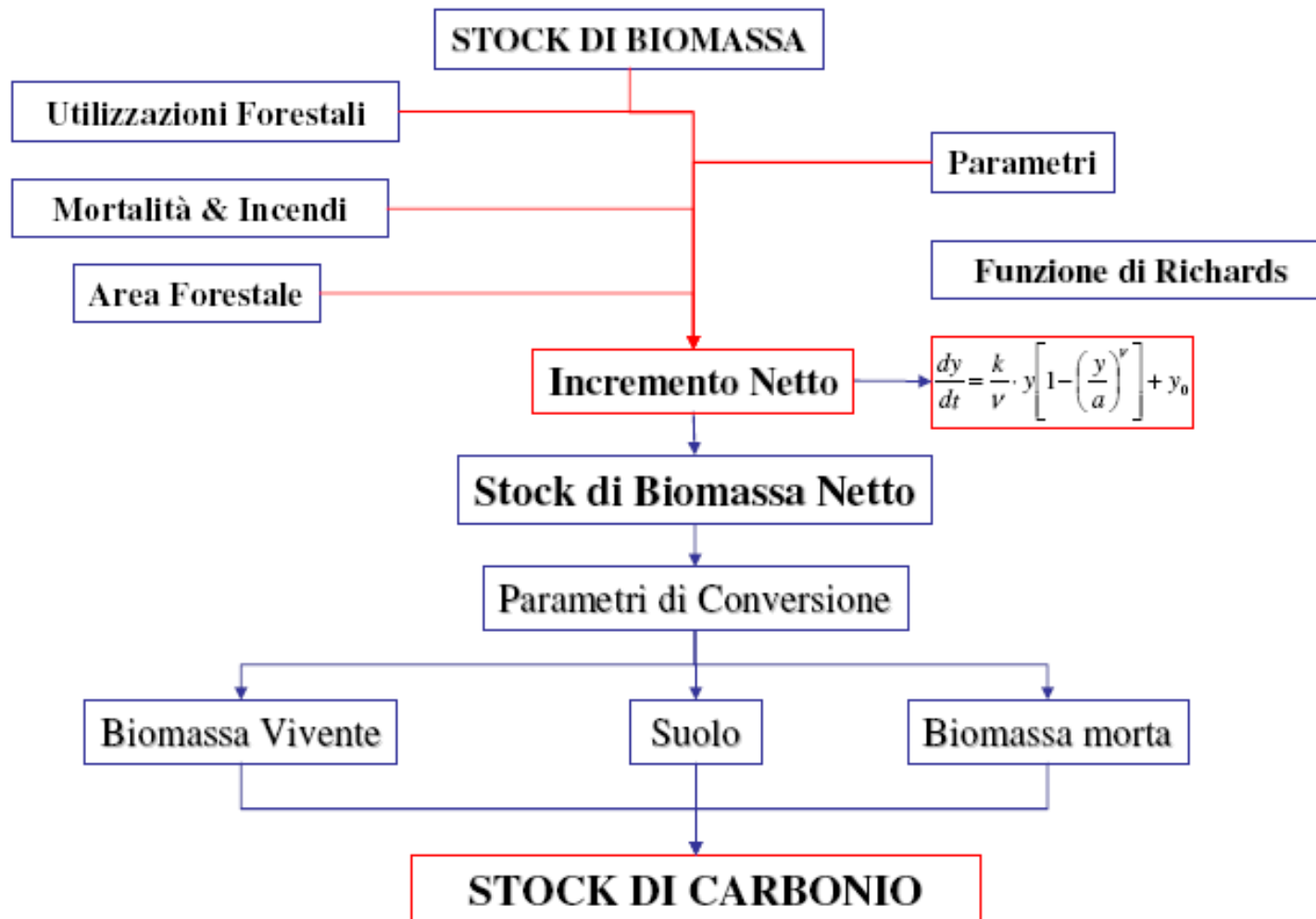
Milano – 25 Marzo 2010

Courtesy of E.Calvo – F. Antognazza - Lombardy

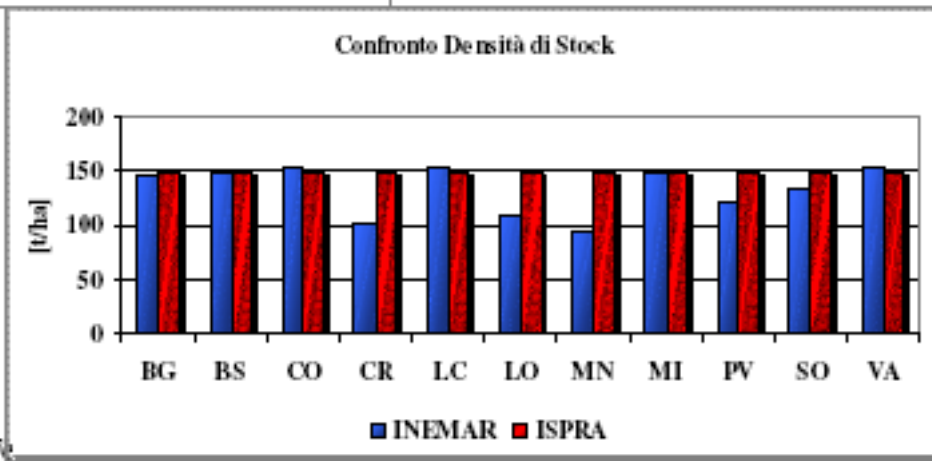
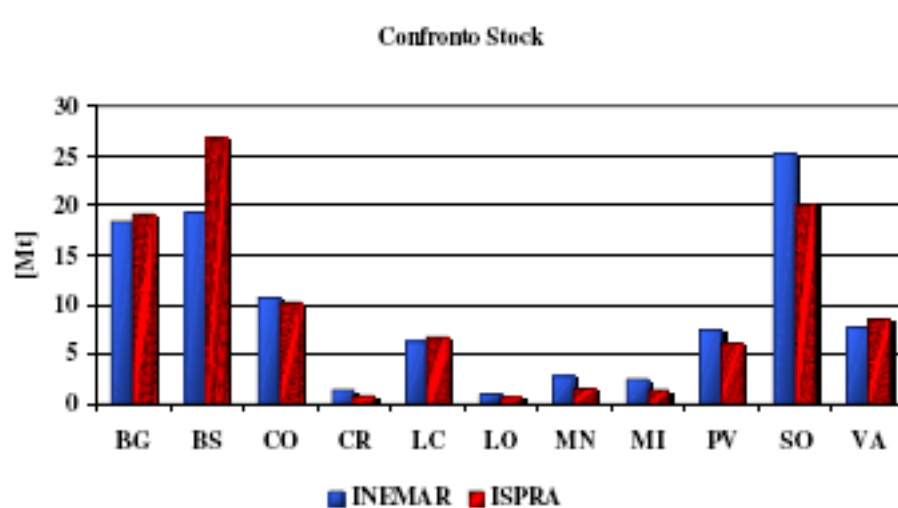
Calculation of C sink (in pools)



Metodologia di Stima

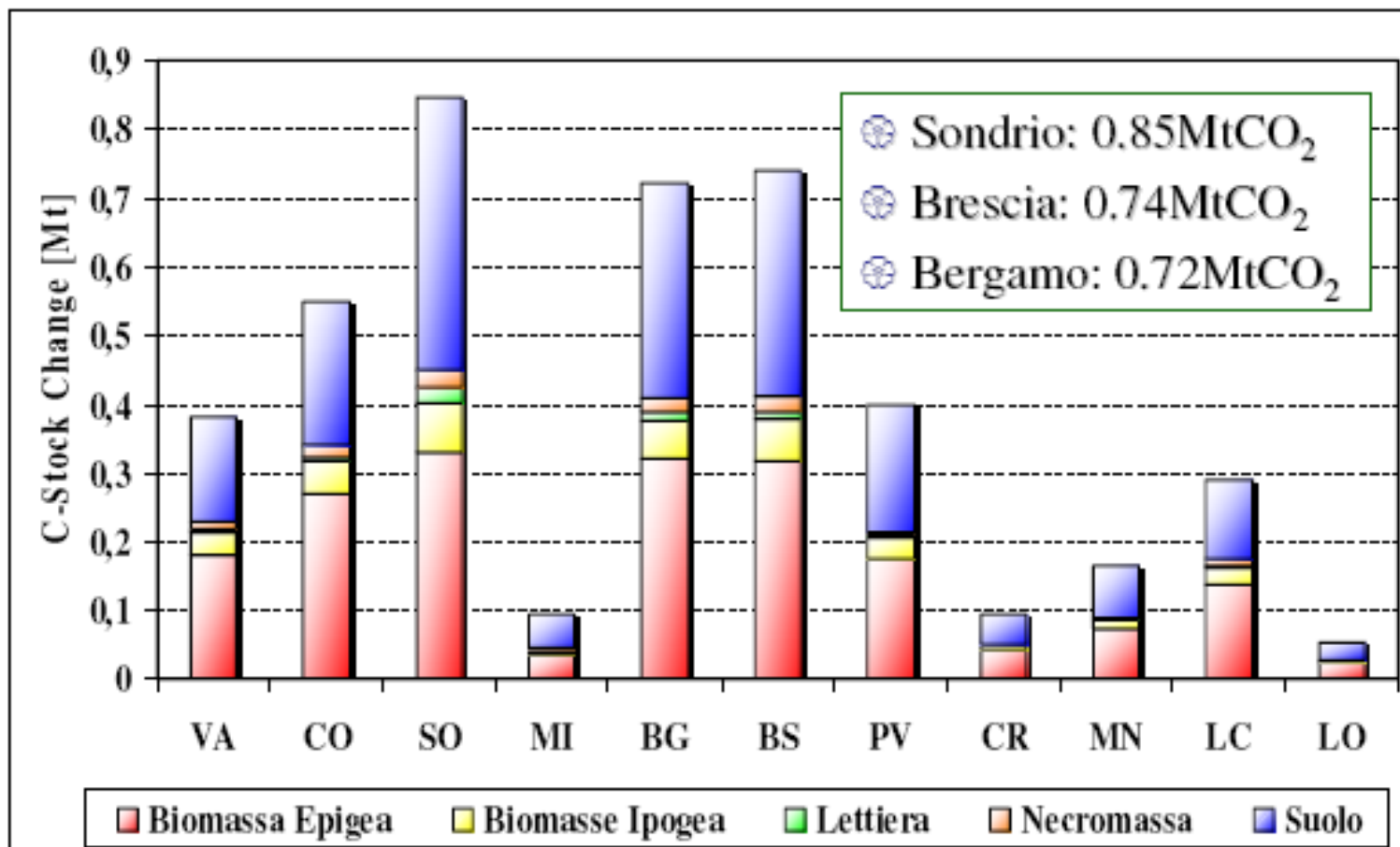


Risultati – Lombardia, 1° Fase



Ing. Antognazza F.

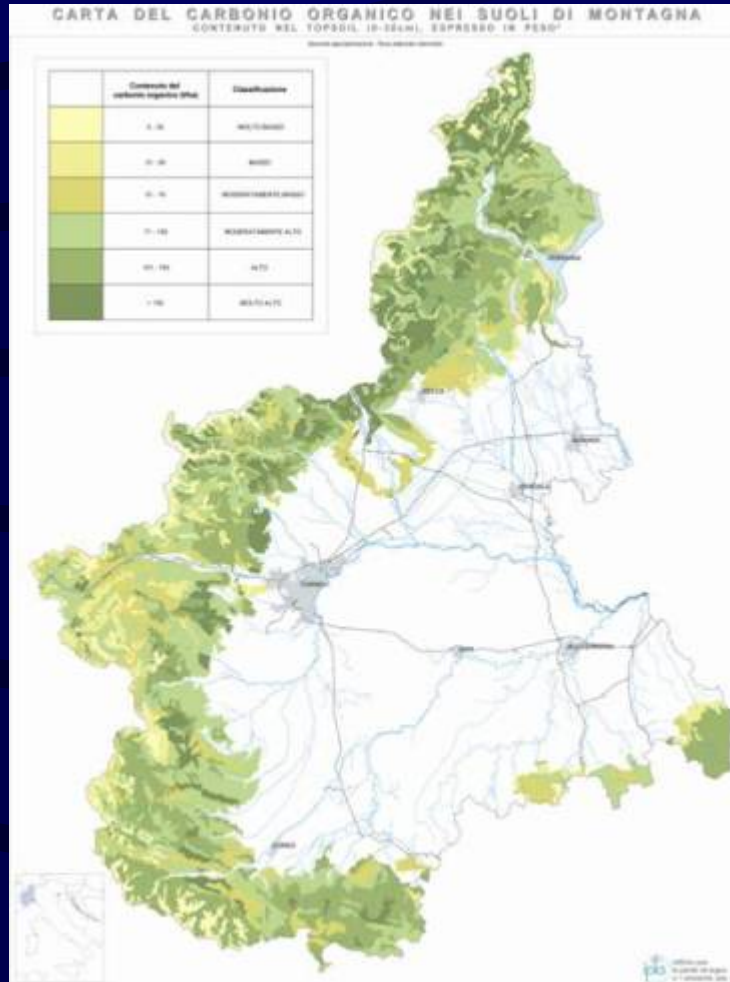
Risultati - Lombardia, 1° Fase



Ing. Antognazza Federico - L'inventario degli assorbimenti di CO₂ in INEMAR

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**Relazione sull'esperienza in Piemonte
nel calcolo degli assorbimenti di
carbonio nel settore forestale per
l'Inventario Regionale delle Emissioni**



	Media C %	Soil (ha)	Total (ha)	t C	t/ha
HILLS	1,15	428.781	454.398	19.145.648	42
MOUNTAIN	3,10	936.829	1.145.641	104.672.189	91
PLAIN	1,58	935.939	1.073.460	51.424.884	48
PIEMONTE	2,08	2.174.699	2.526.996	175.242.721	69

Courtesy of IPLA – Fabio Petrella

	Forestry Surface	aboveground carbon	belowground carbon	dead carbon	litter carbon	soil carbon	global carbon
	ha	t	t	t	t	t	t
tot	993.355	54.439.361	10.676.643	7.277.099	6.811.345	78.806.300	158.010.749
t/ha		54,8	10,7	7,3	6,8	79,3	159

Courtesy of IPLA – Fabio Petrella



REGIONE DEL VENETO



Miglioramento delle politiche
verso i mercati locali
e volontari del carbonio
per la mitigazione
del cambiamento climatico

*Improvement of policies
toward local
voluntary carbon markets
for climate change mitigation*



REGIONE AUTONOMA
FRIULI VENEZIA GIULIA



www.carbomark.org

Scheme for voluntary C market – Veneto Region

Carbomark characteristics

1. **Clearness:** **Carbomark** features clear criteria for credit eligibility and provides methods to guarantee that they are real, permanent, additional and unique.
2. **Rigour and reliability:** credit credibility and reliability are the result of a close analysis that even takes possible accidents into account, through an instrument called credit “buffer” (or “reserve”) which considers the risks related to possible loss and lower offsetting. On the other hand, sale contracts establish binding long-term obligations for both parties – seller and buyer.
3. **Transparency and information:** the criteria to choose the criteria, the basic requirements and the methods for project evaluation – such as, credit permanence, baseline, counting and monitoring – are the result of a rigorous scientific work that has defined specific protocols for each type of credit considered. These protocols are available to anyone that may have information on project procedures and approach. Information transparency is also ensured through the website **www.carbomark.org** where full information and project documents can be found.
4. **Innovation:** in **Carbomark** market it is represented both by the “local” platform to trade credits and by the definition of protocols to quantify carbon sequestration with innovative mitigation measures, such as the use of wood products instead of materials with higher energy intensity, urban forestry and biochar.

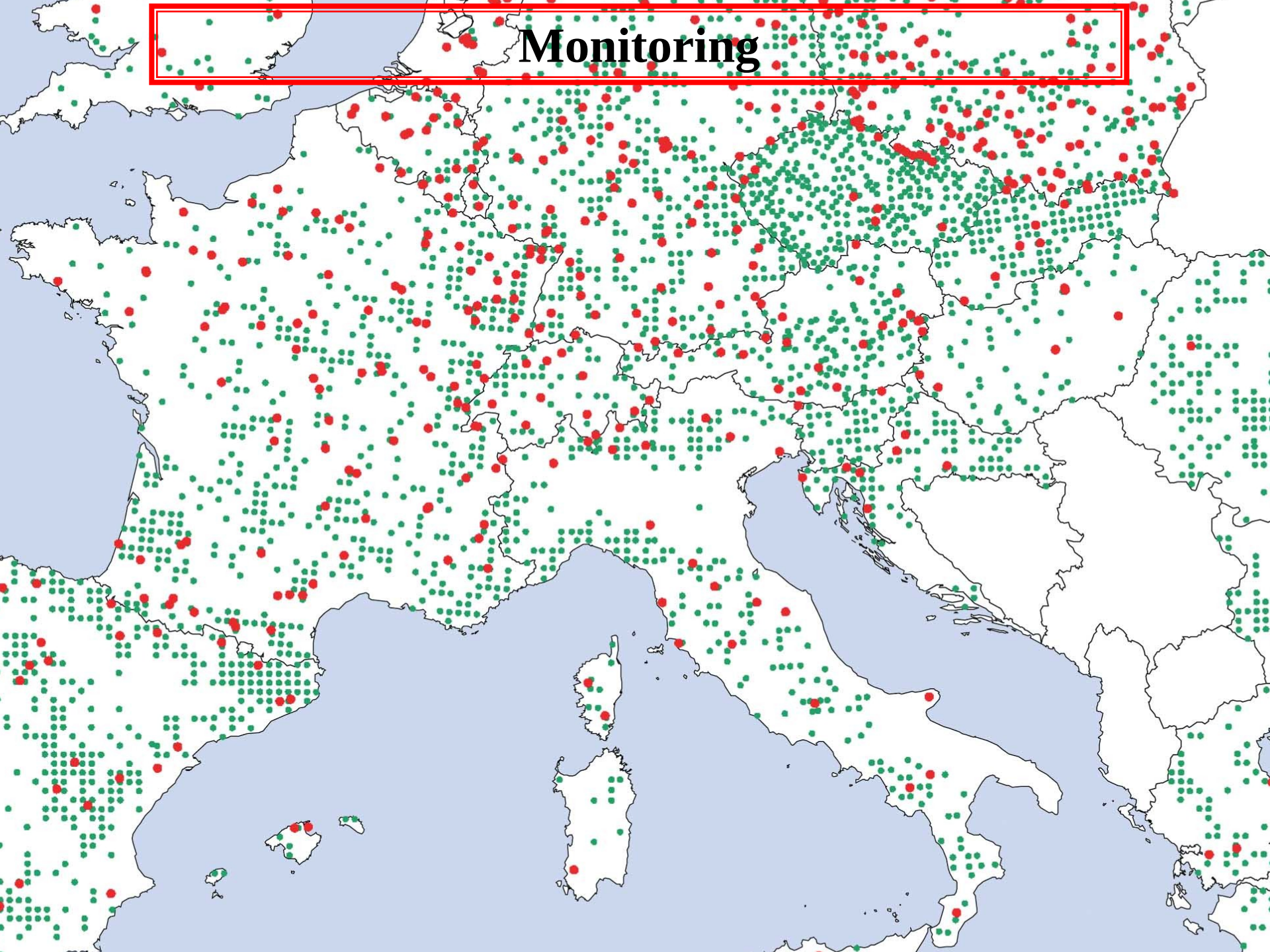
Remark:

- 1. All Alpine countries are Party to the Kyoto Protocol**
 - 2. Inventory sent to UNFCCC/KP in the last 3 years**
 - 3. Could be a first reference**
- And: its official!**



Possible help from research and monitoring

Monitoring

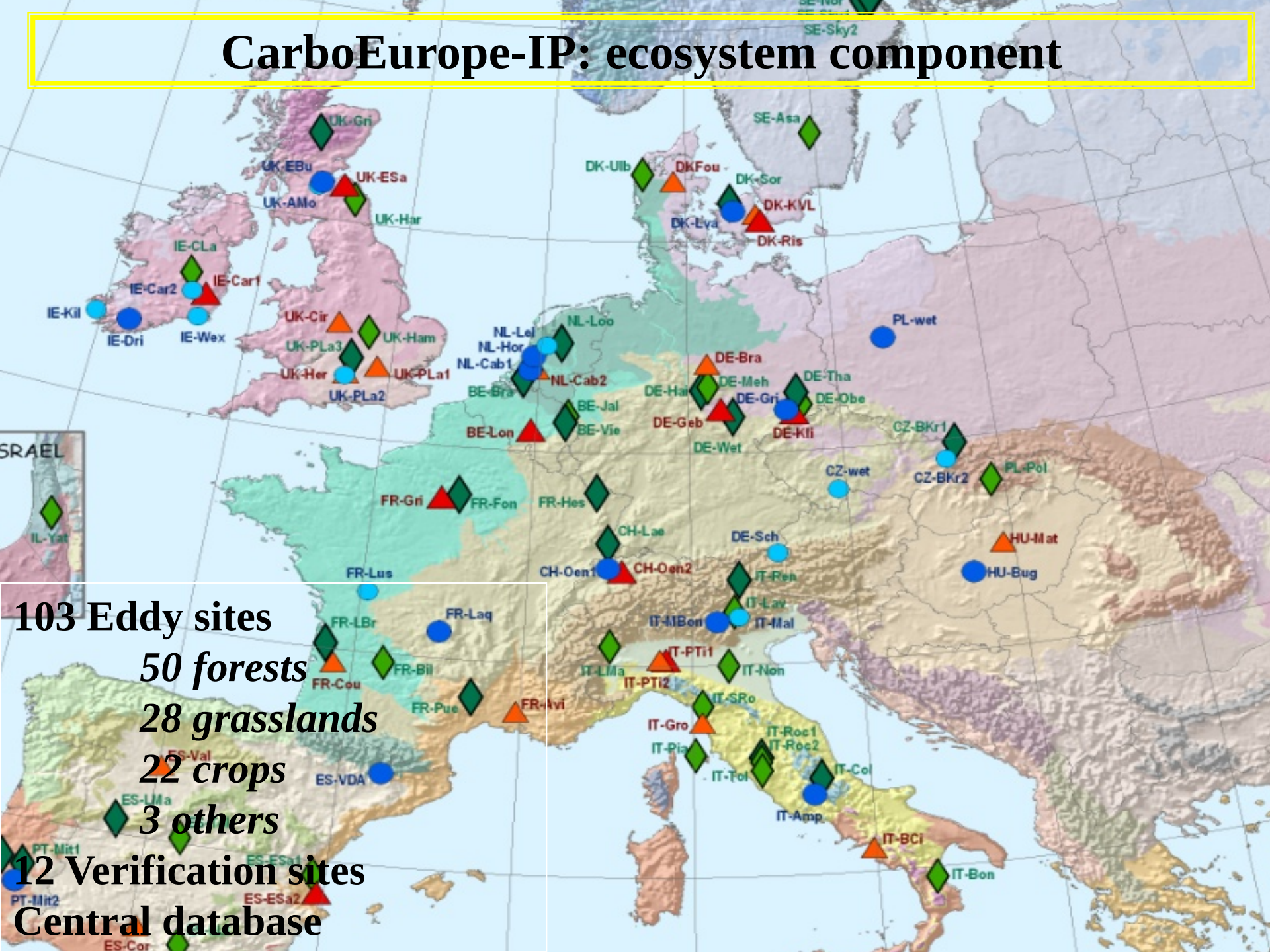


Monitoring networks: ICP-IM

Geographical location of the integrated Monitoring sites



CarboEurope-IP: ecosystem component



Torgnon, 2050 m
Larch (2010)

Mixed conifers (2002)

Lavarone, 1350 m

Renon (1996)

Collelongo (1993)

Bonis (2003)

Italy: Flux towers in mountain forests

Measurement of net carbon exchange through Eddy covariance



$$F_{\text{NEE}} = F_{\text{C}} + F_{\Delta\text{S}} + \text{advective terms}$$

Set-up: tower, sonic anemometer, gas analyser



13.05.2005



Collelongo (1600 m a.s.l.)

Beech forest

100 → 110 years old

$T = 7.1\text{ }^{\circ}\text{C}$, Prec. 1088 mm

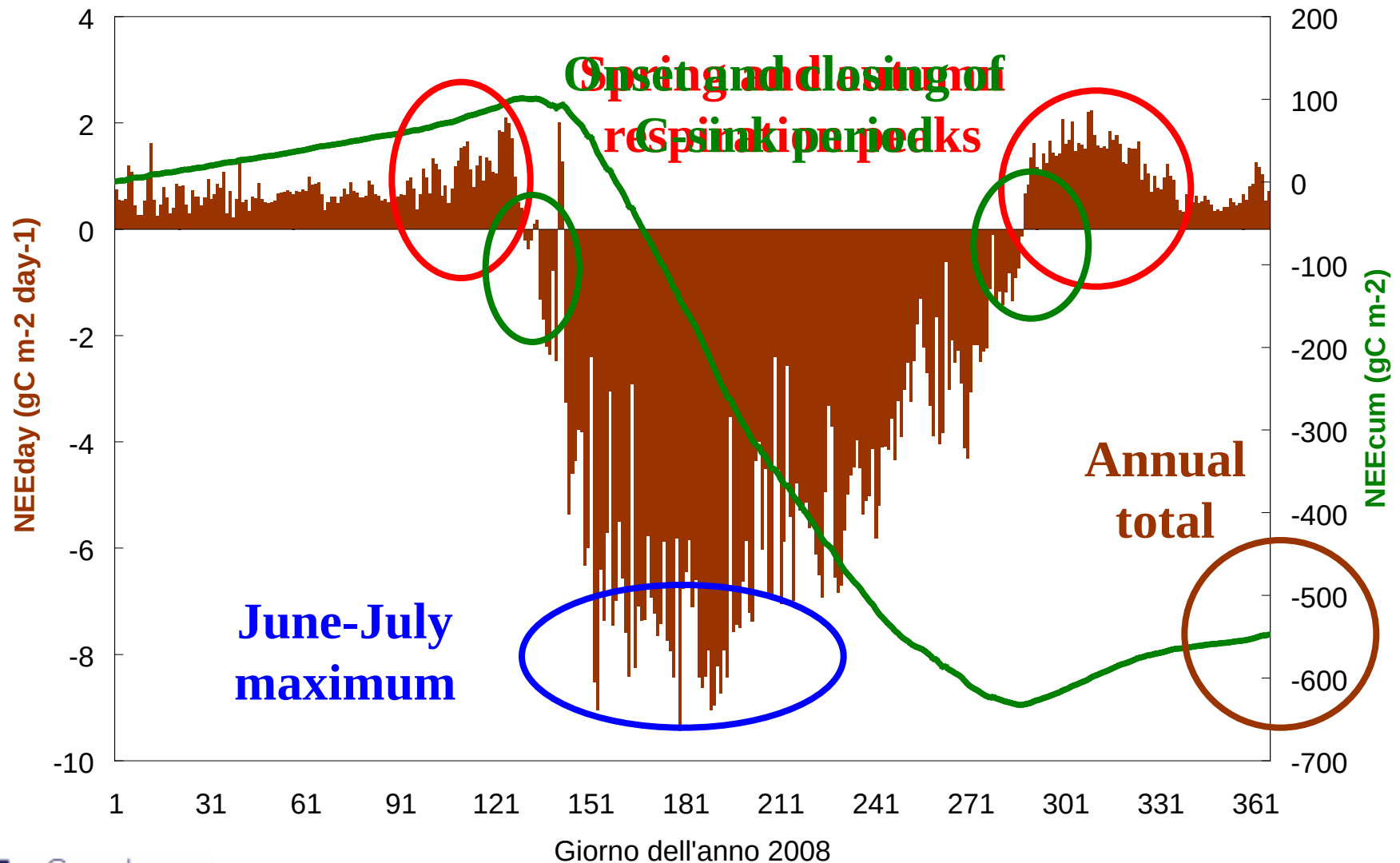
3.5-4 months snow cover

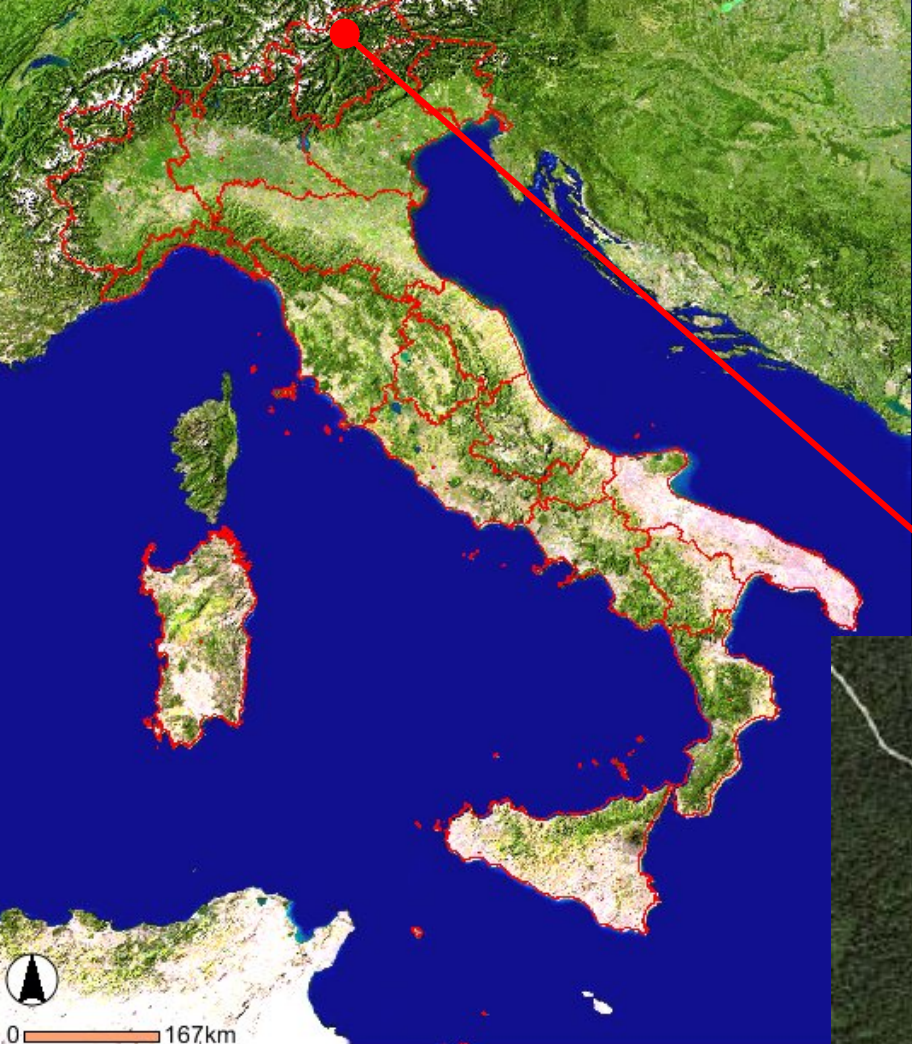
LTER site



Flux site

Annual trend of Net Ecosystem Exchange 2008

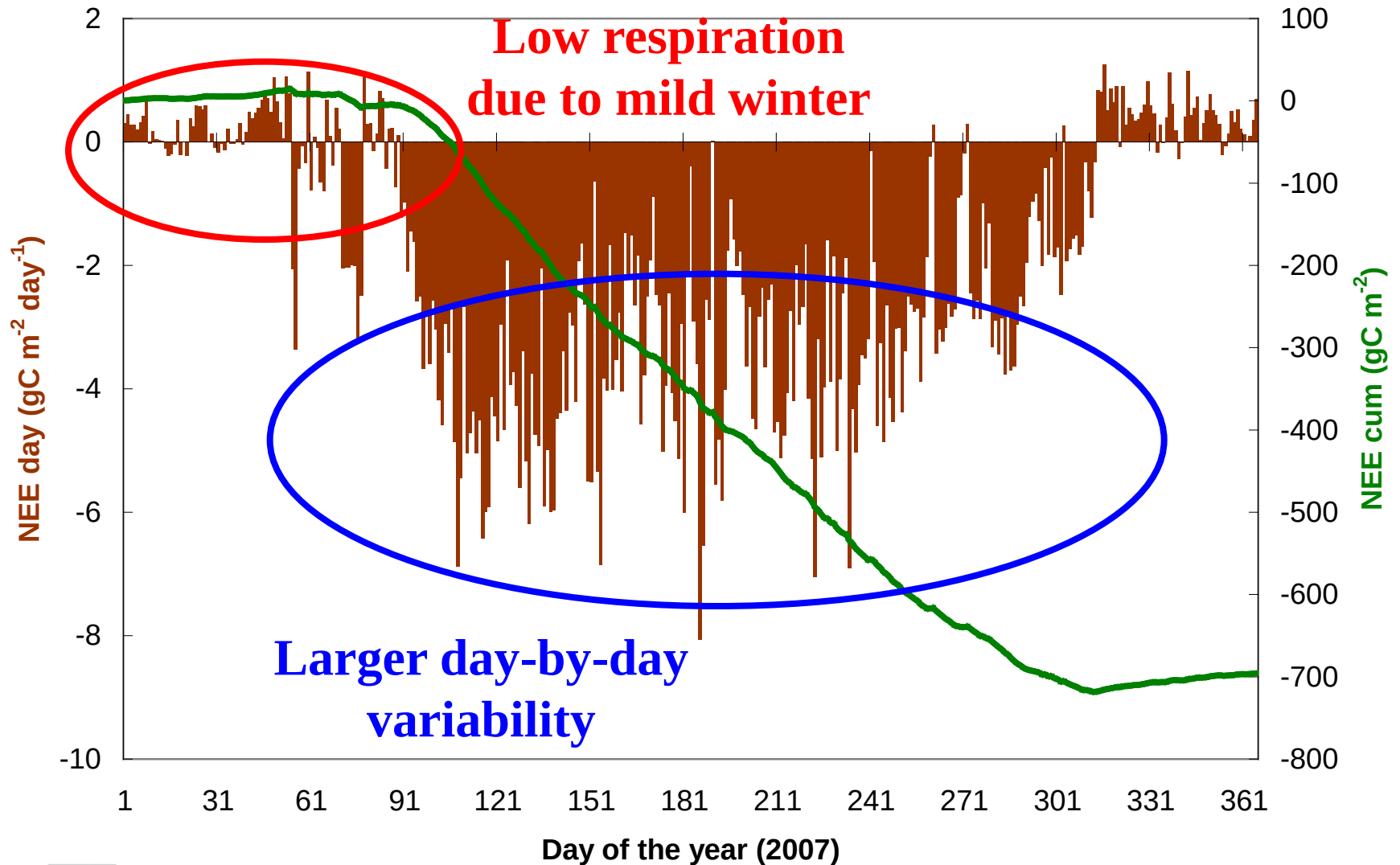




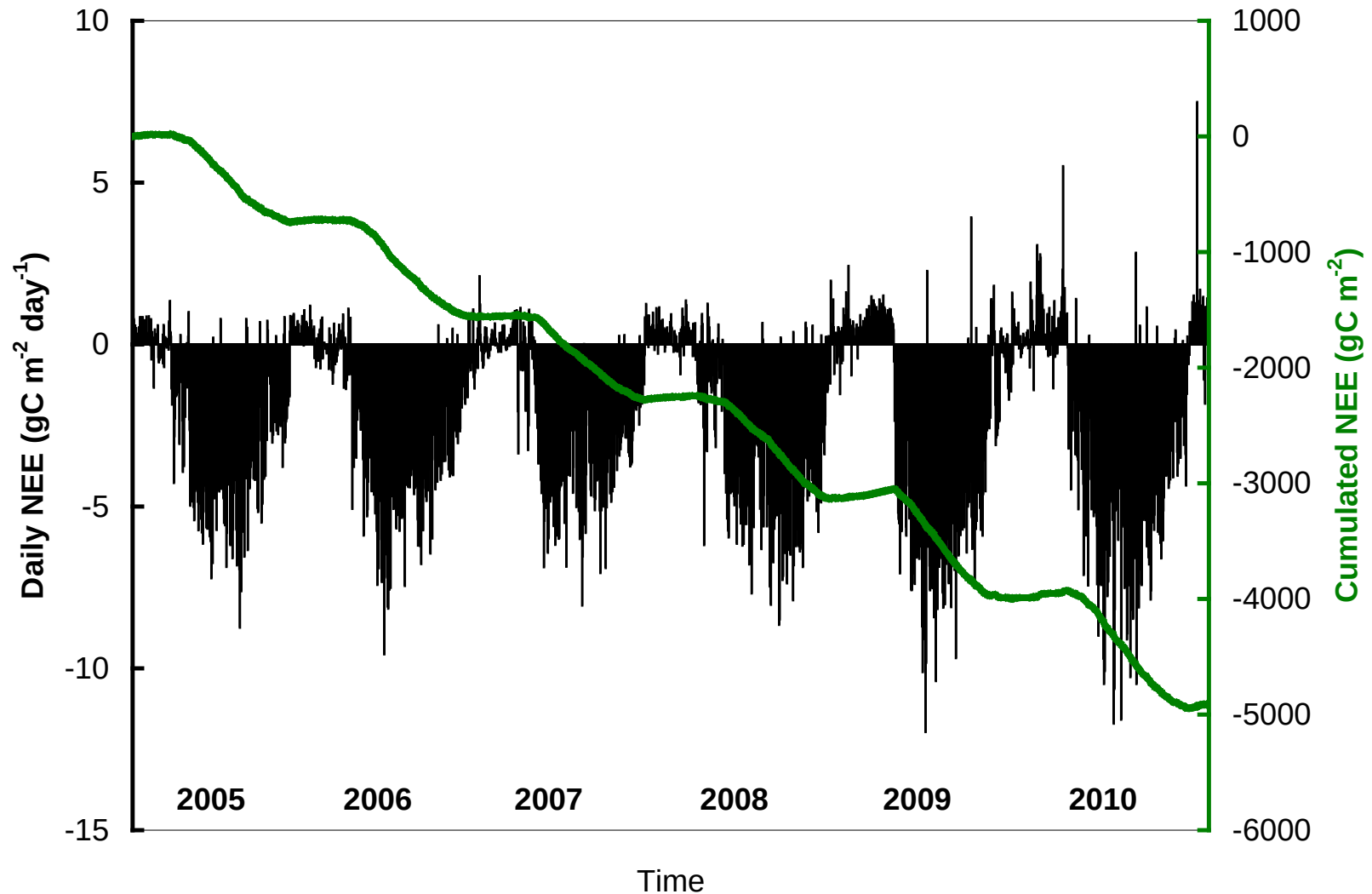
Renon (1730 m a.s.l.)
Mixed conifers (spruce)
Unevenaged
T = 4.4 °C, Prec = 1000 mm
5 months snow cover
LTER site



Annual trend of Net Ecosystem Exchange 2007



Renon, conifers: C-budget 2005 - 2010



Concluding remarks

- ✓ Very relevant role of Mountain forests in Italy:
area (35%), biomass (46%), productivity (40%)
- ✓ There are examples of accounting in Alpine Regions
- ✓ Kyoto Inventory : could be a first reference
- ✓ All intensive sites measured show Net C sink (3 to 8 tC ha⁻¹ yr⁻¹)
- ✓ Intensive research: process understanding
- ✓ Long term:
role of drivers, disturbances (incl. management), climate change



**Thanks for
your attention!!!!**



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italian presidency 2013-2014
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