

Modelling tools for soil organic carbon and GHG accounting

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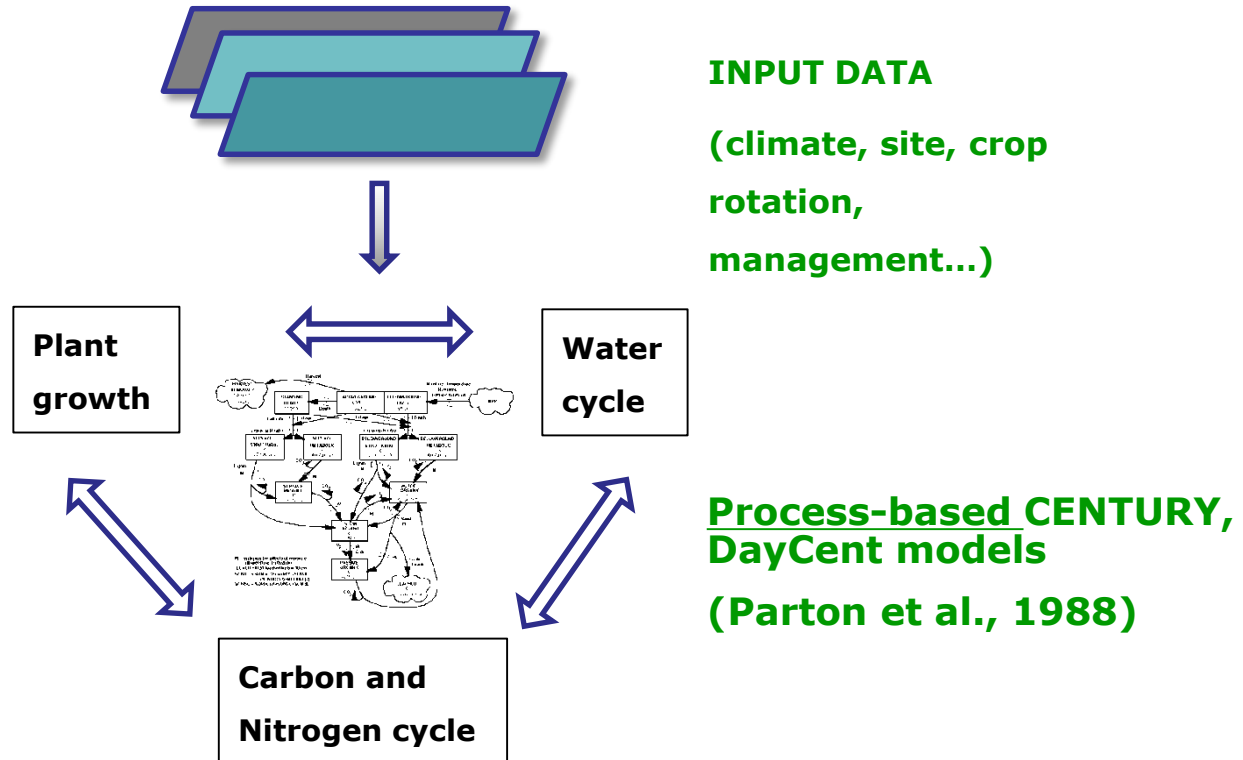
¹ EU-JRC, IES, LRM

² Colorado State University

JRC technical workshop on LULUCF reporting

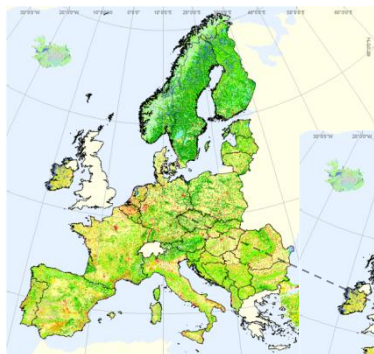
26-27 May 2015, Arona (Novara, Italy)

1. Large-scale SOC modelling application (1 km) at EU I.
2. Web based platform for farm-scale GHG accounting

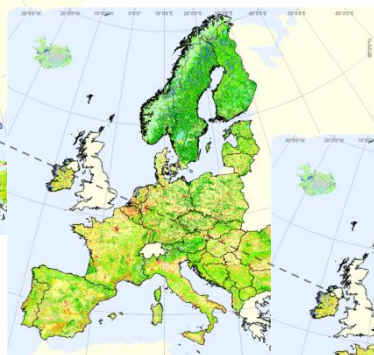


1. EU SOC modelling

1990



2000



2006



CLC

Agricultural land use

- GR = GR
- CR = CR
- All the possible agricultural LUC

**Crop rotation from
EUROSTAT**

Organic N

Mineral N

CN manure

FAOSTAT

Irrigation



CLC

arable

complex

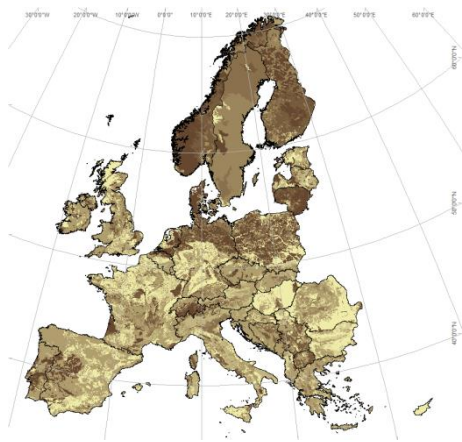
vineyard

olive

orchard

rice

pasture

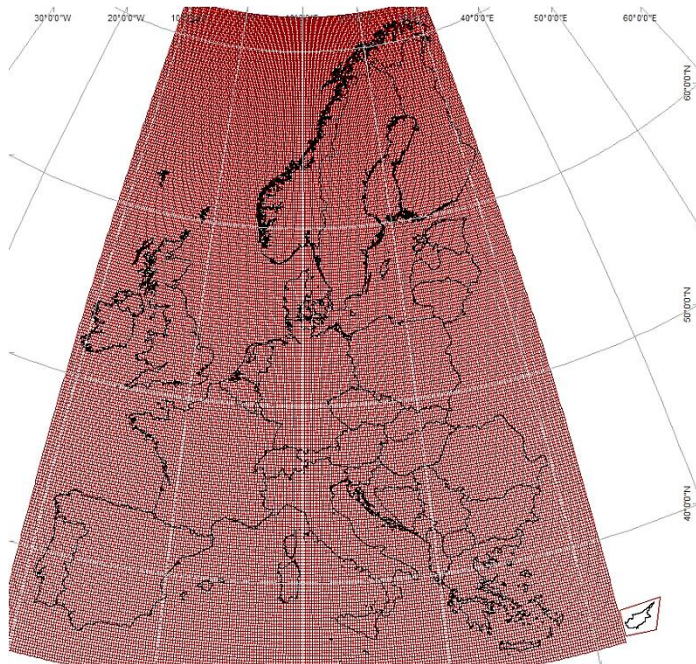


European Soil database

texture, BD, soil depth, pH, drainage class, vol. of stones, OC_top



**PTF Rawls to estimate hydraulic properties (FC & WP)
Corrected for gravel [1- vol. stone/100]**



Meteorological data

CRU grid 10' x 10'

<http://www.cru.uea.ac.uk/cru/data/hrg/>

Actual data [1900-2000]

Climate projection [2000-2100]

Monthly data:

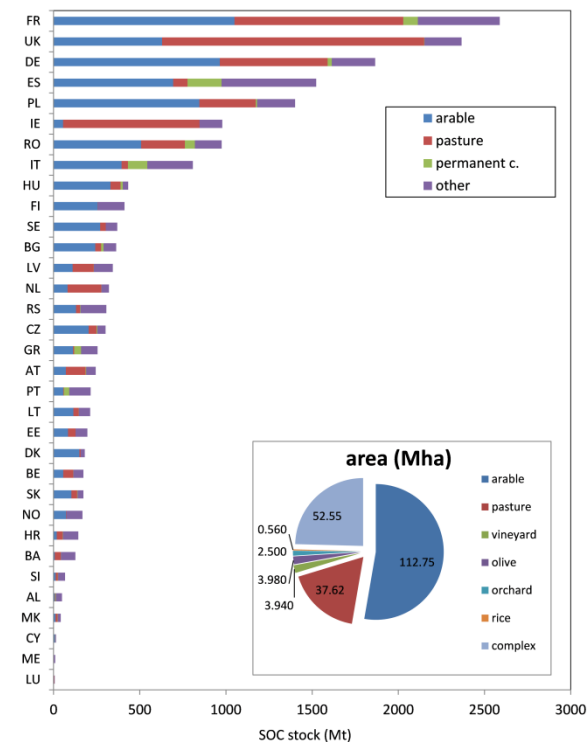
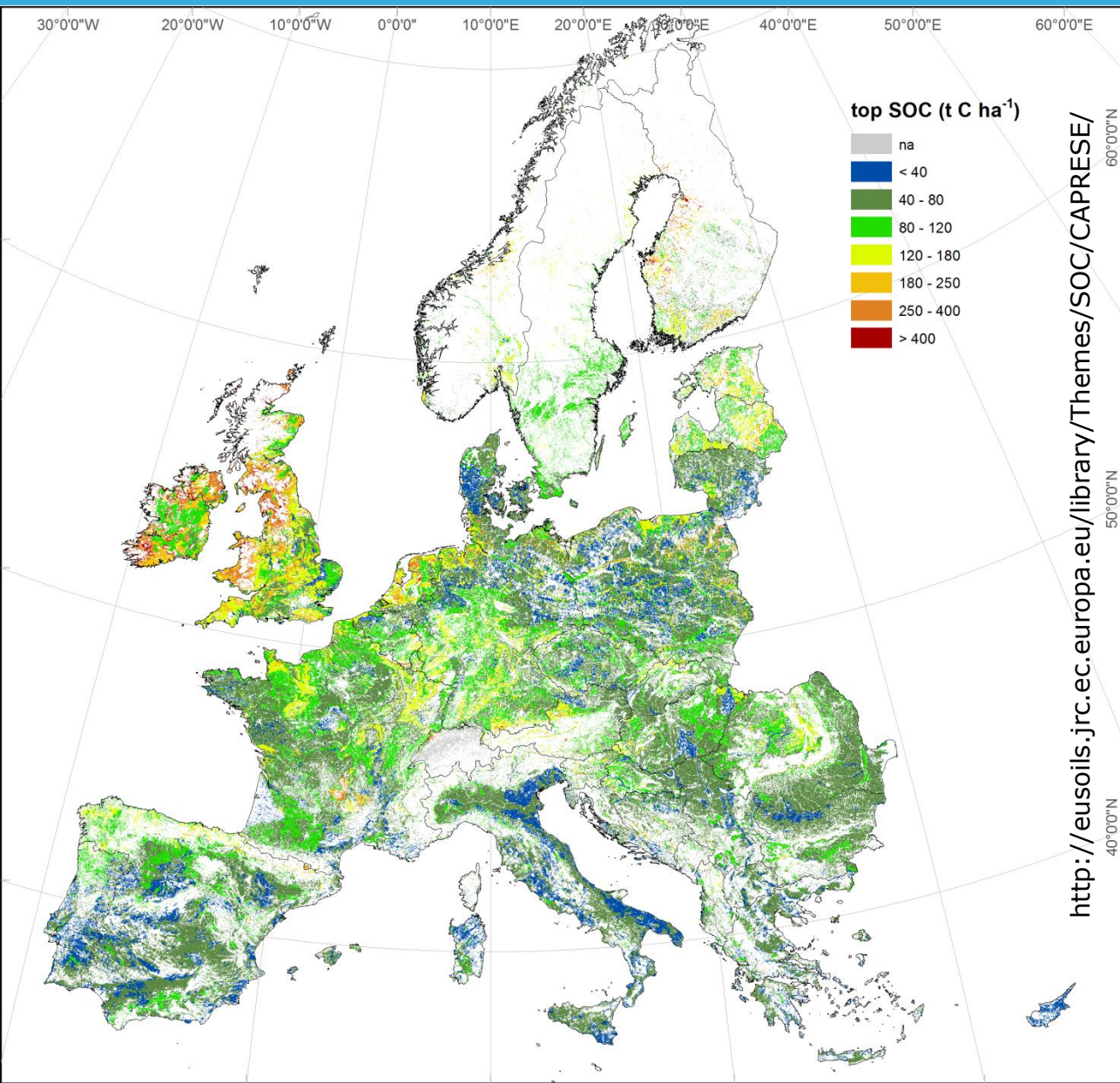
Tmax, Tmin, precipitation

SIMULATION RESULTS

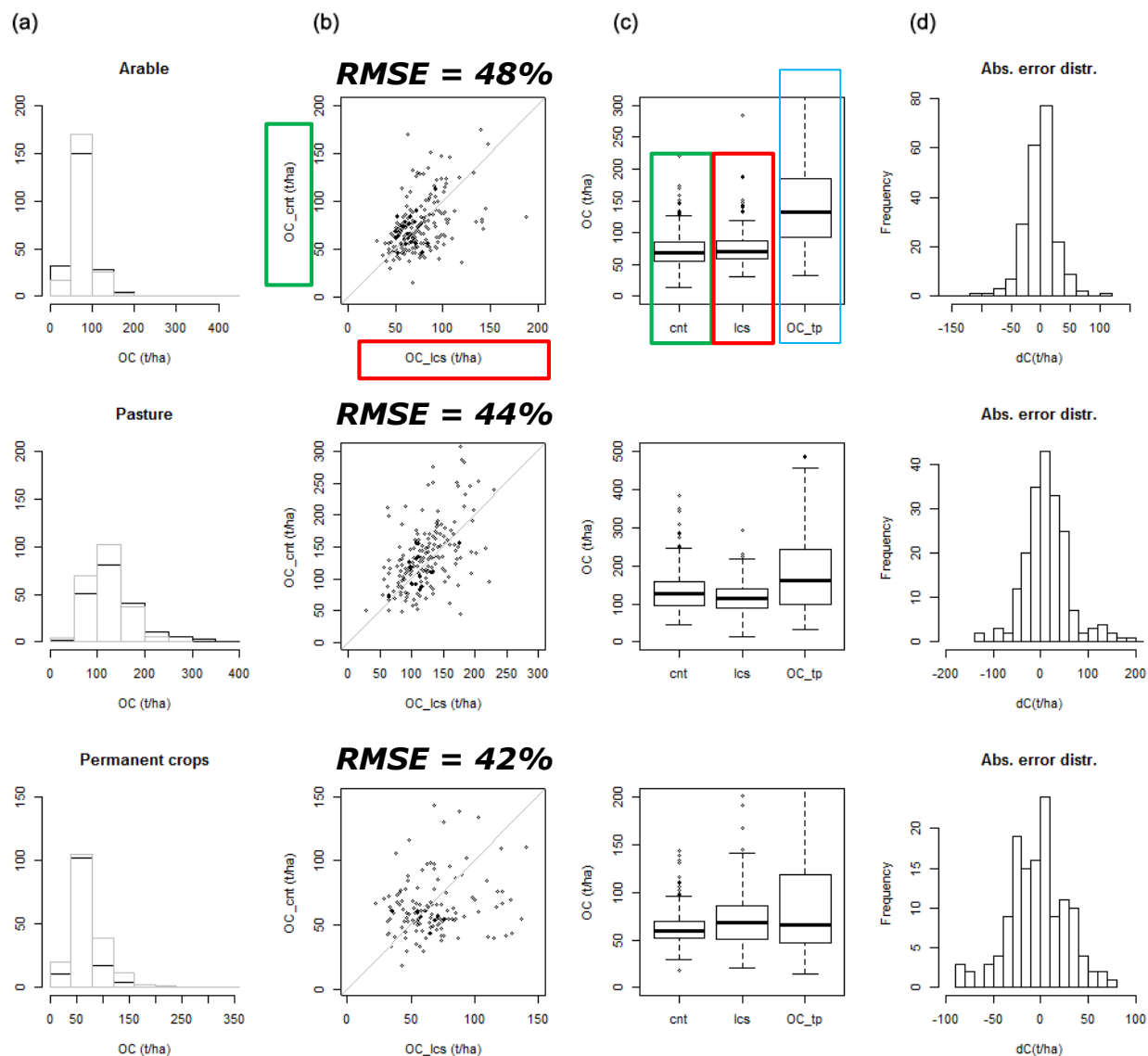


Top-soil (0-30 cm) organic carbon content (t C ha⁻¹) in 2010

17.63 Gt of C



MODEL VALIDATION



Comparison with LUCAS dataset

*direct field observations
gathering fully harmonised
data on land use/cover in
EU27*

<http://eusoils.jrc.ec.europa.eu/projects/Lucas/>

Soil samples 2009-2010

- SOC concentration (g kg^{-1})
- BD estimator (Hollis et al., (2012))

Century

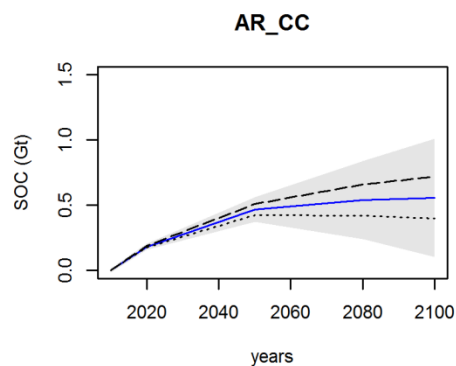
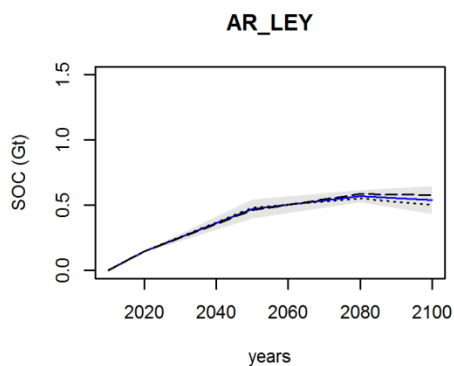
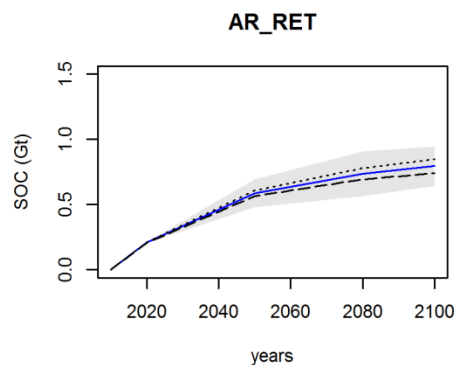
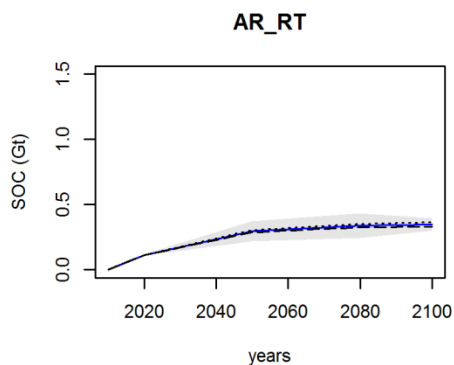
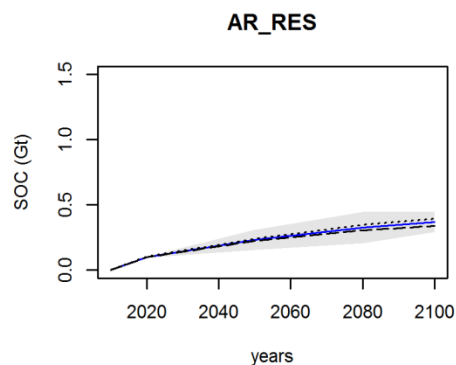
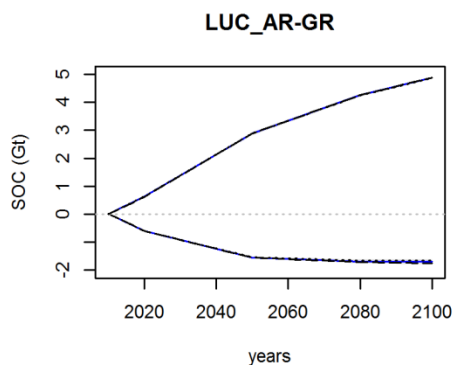
LUCAS

SOC sequestration scenarios

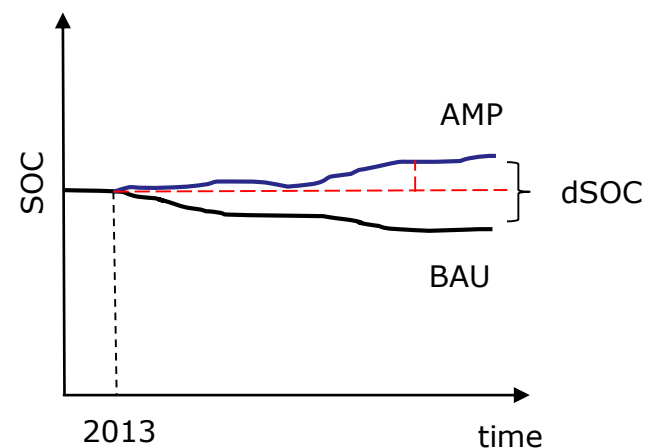


- 1) Conversion from arable to grassland (**LUC_AR_GR**)
- 2) Crop residue management (**AR_RES**): 100% incorporation of cereal straw compared to 50 % of BAU scenario;
- 3) Reduced tillage scenario (**AR_RT**): substitution of the mouldboard plough with a more superficial tillage;
- 4) Combined residue incorporation + reduced tillage (**AR_RET**);
- 5) Ley in rotation (**AR_LEY**): inclusion of two consecutive years of a fodder crop (alfalfa) in the BAU rotation;
- 6) Cover crop (**AR_CC**): the insertion of cover crops in the rotation schemes, which biomass was entirely incorporated (green manure).

Cumulated SOC sequestration trends



Technical potential SOC sequestration
Full application of alternative
management practices to 'arable' land
category (120 Mha) from 2013



2. FARM-SCALE GHG accounting platform



Comète-Mondiale

- New project – FACCE-JPI
- **Adapt COMET-Farm platform for use in EU countries, Brazil & Australia**
- Backend spatial databases for climate, soil, land use
- Support for multi-language interface
- Integration of modules for additional/alternative methods (e.g. ECOSSE model, RothC, EU and country-specific livestock emission parameters)
- Menu options for baseline and 'best-management' practices, with option to customize management for individual fields or field subunits
- Validation and verification work for all source category models

Developed from
COMET FARM

Leader: prof K. Paustian
(Colostate Univ. - US)

- JRC
- France (IRD, INRA)
- Switzerland (ETHZ)
- Spain (CSIC)
- UK (Univ. Aberdeen)
- Brazil (CTBE)
- Australia (QUT)

THANK YOU FOR YOUR ATTENTION

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