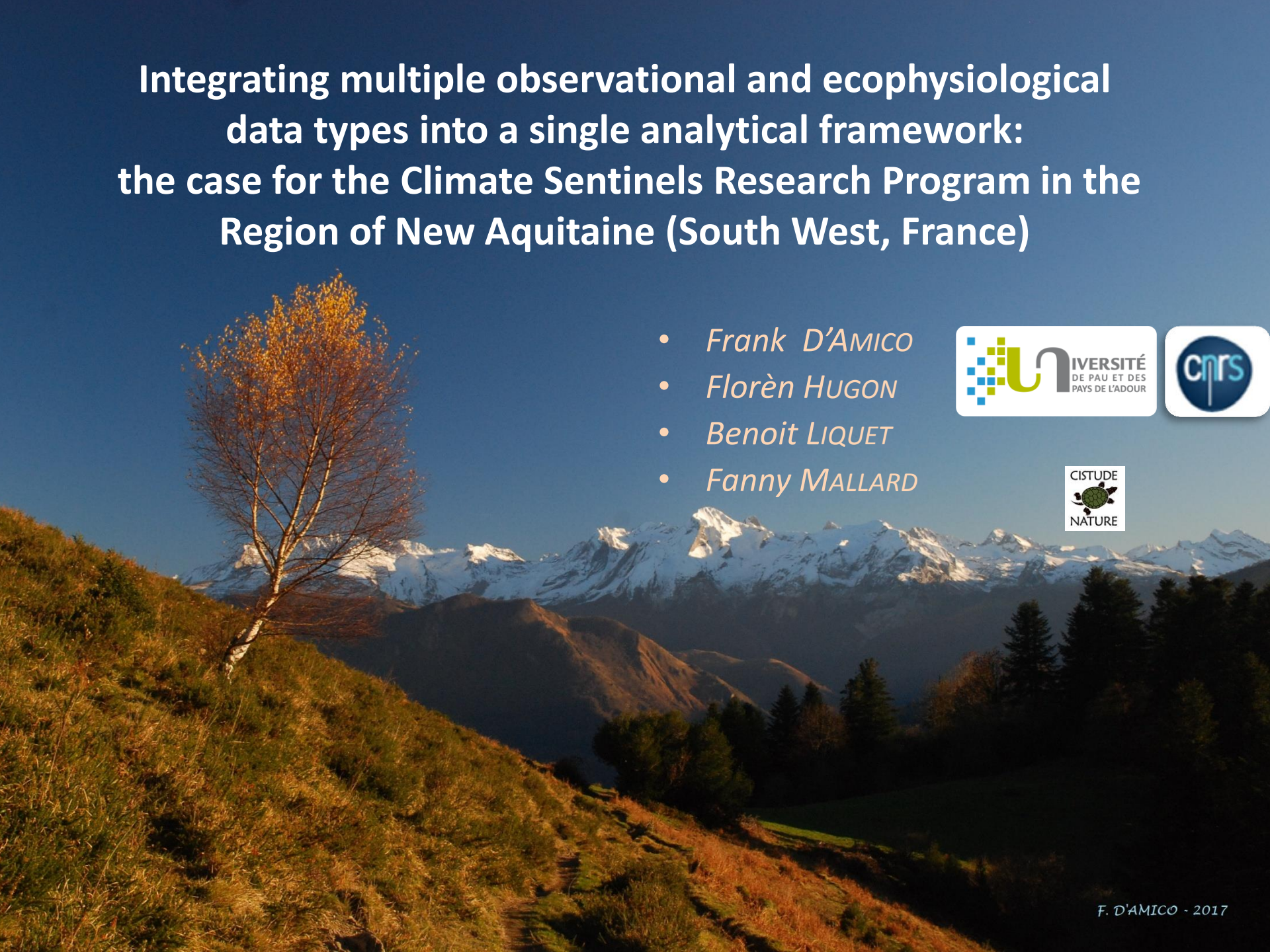
Integrating multiple observational and ecophysiological data types into a single analytical framework: the case for the Climate Sentinels Research Program in the Region of New Aquitaine (South West, France)

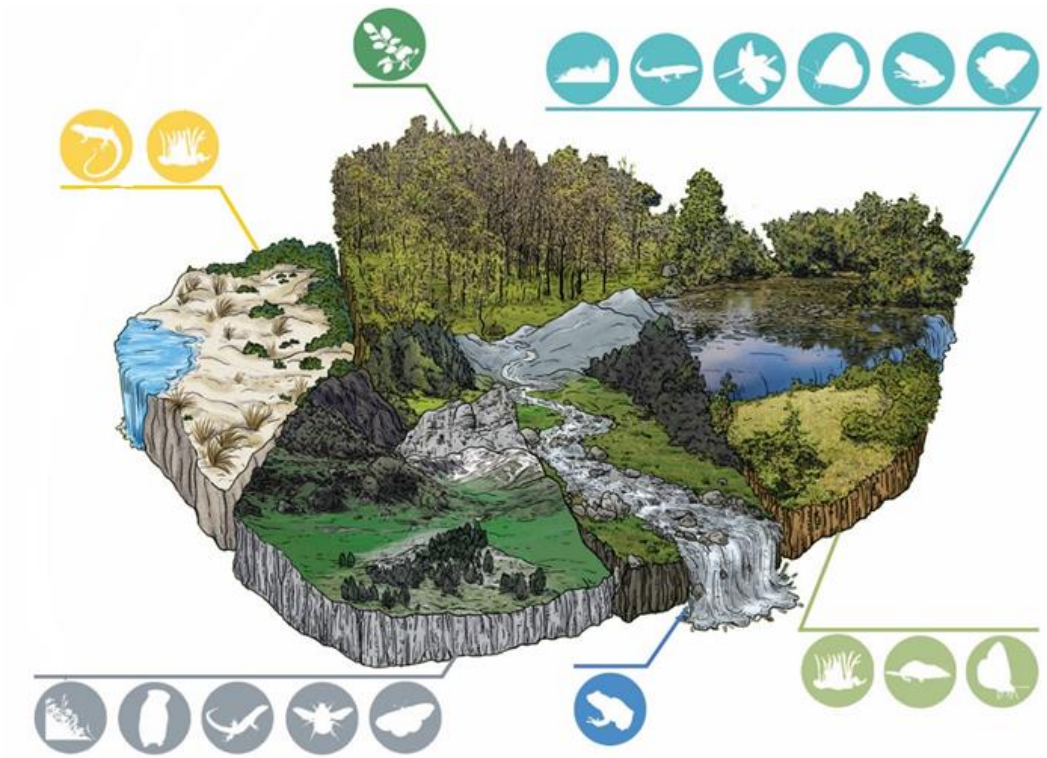
- *Frank D'Amico*
- *Florèn Hugon*
- *Benoit Liquet*
- *Fanny Mallard*



The “CLIMATE SENTINELS” research programme

Effects of climate change on biodiversity in the New Aquitaine region in France

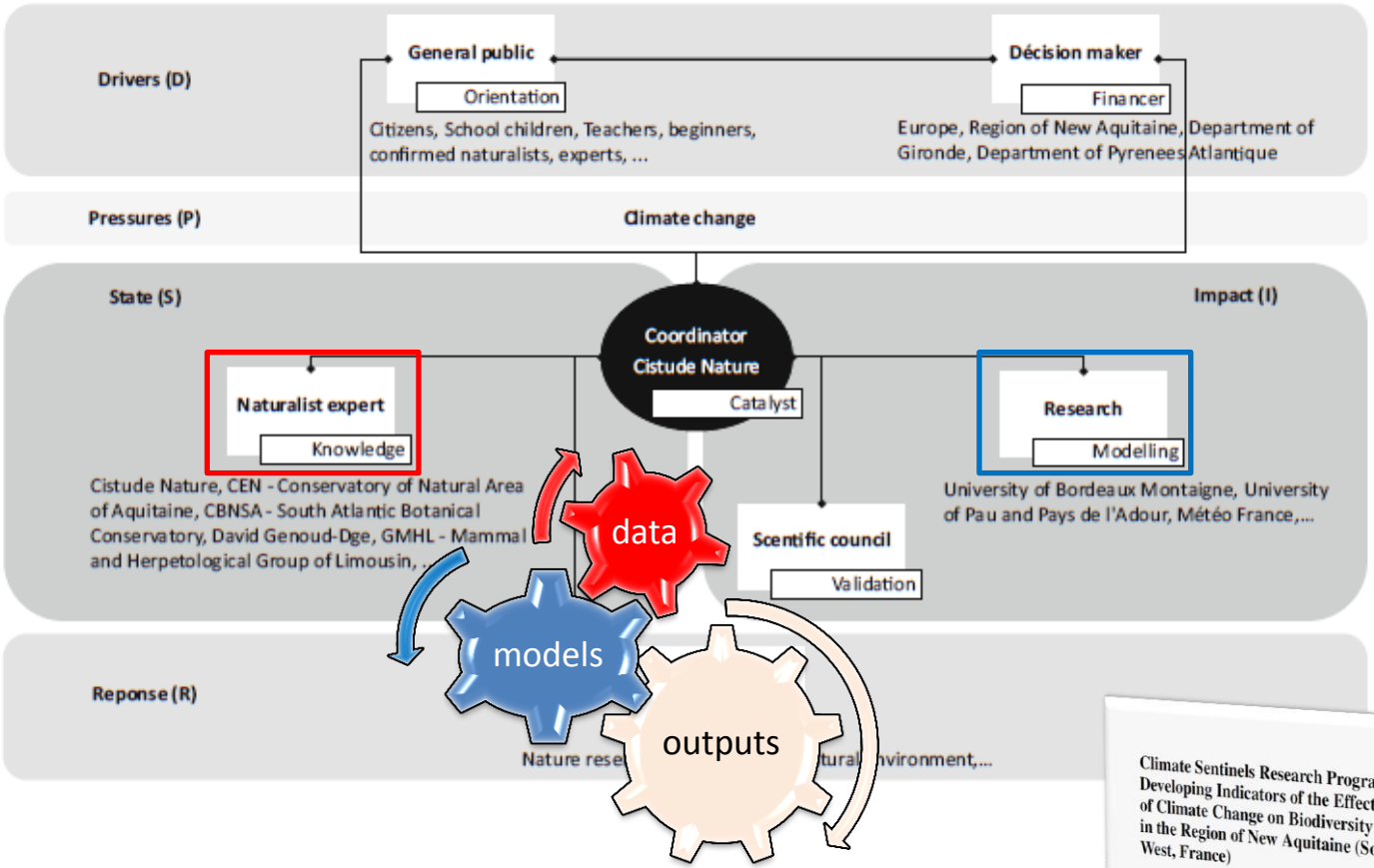
Pyrenees Mountain

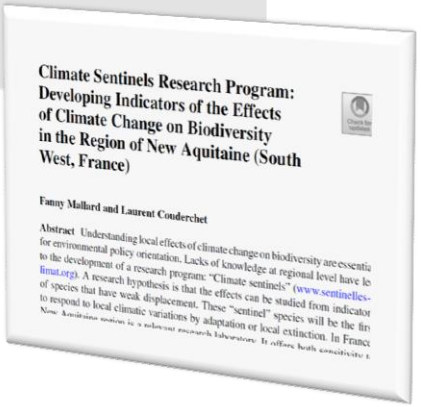


www.sentinelles-climat.org

The “CLIMATE SENTINELS” research programme

under the Driver (D)—Pressure (P)—State (S)—Impact (I)—Responses (R) “DPSIR” scrutiny

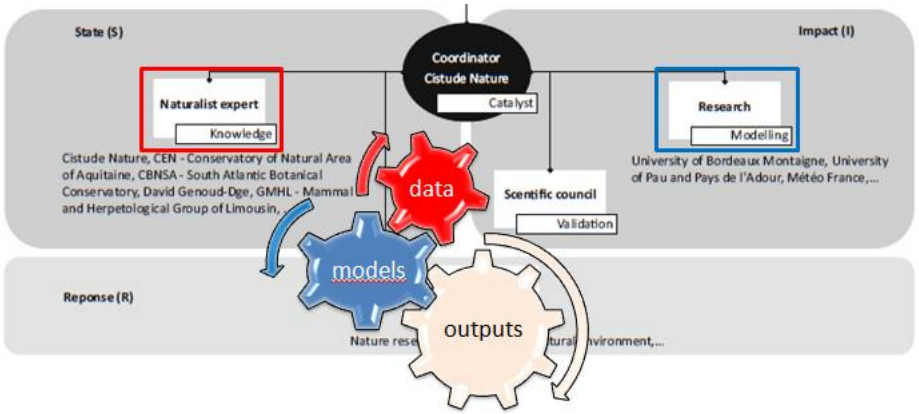



Climate Sentinels Research Program: Developing Indicators of the Effects of Climate Change on Biodiversity in the Region of New Aquitaine (South West, France)

Fanny Mallard and Laurent Couderchet

Abstract Understanding local effects of climate change on biodiversity are essentia for environmental policy orientation. Lacks of knowledge at regional level have le to the development of a research program: “Climate sentinels” (www.sentinelles-limat.org). A research hypothesis is that the effects can be studied from indicator of species that have weak displacement. These “sentinel” species will be the firs to respond to local climatic variations by adaptation or local extinction. In France

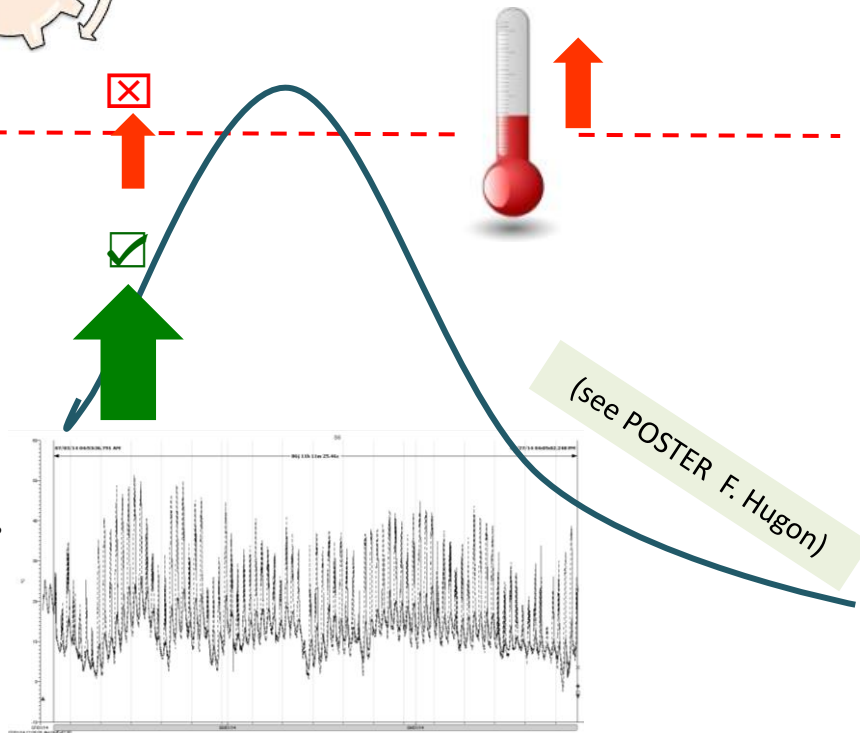
Mallard F. & Couderchet L. (2019). Climate Sentinels Research Program: Developing Indicators of the Effects of Climate Change on Biodiversity in the Region of New Aquitaine (South West, France) in W. Leal Filho et al. (eds.), *Handbook of Climate Change and Biodiversity*, Climate Change Management, https://doi.org/10.1007/978-3-319-98681-4_14 © Springer Nature Switzerland AG 2019



Iberolacerta bonnali

Podarcis liolepis

Podarcis muralis

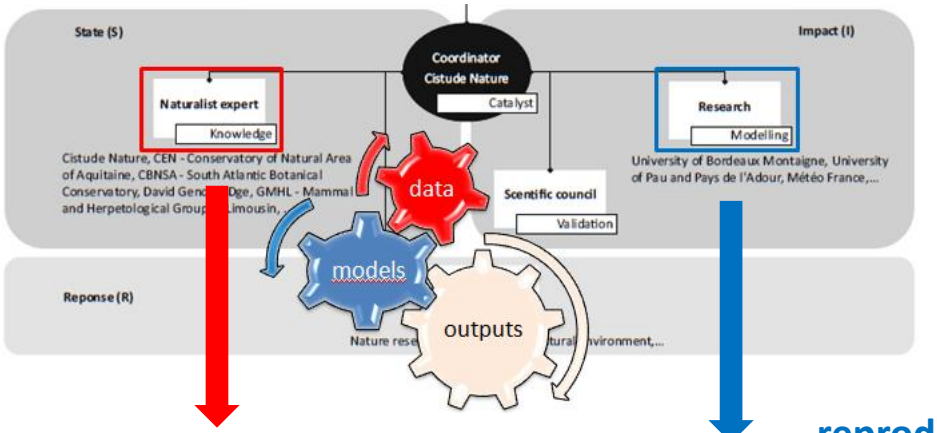


Biophysical models ➔ Operative temperature T_e

F. D'Amico ©

M. Berroneau©

$$h_{a,m}(T_{Min,m} - T_{b,MinActivity}) = \tau_{a,1}(1 + \tau_{a,2}exp[-\tau_{a,3}(T_{Min,m} - T_{b,MinActivity})]^{(1/\tau_{a,4})}$$

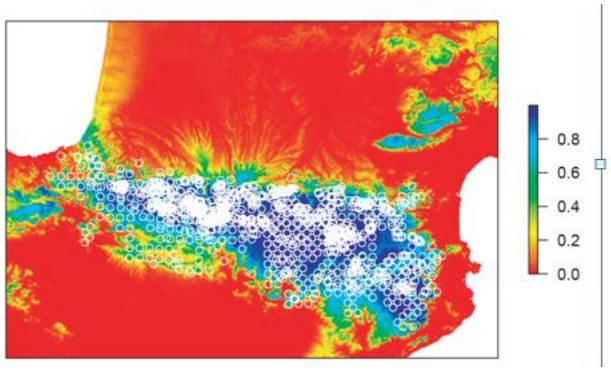


reproducible &
advanced probabilistic sampling*

behavioral data
high-resolution presence/absence data
occupancy and count data

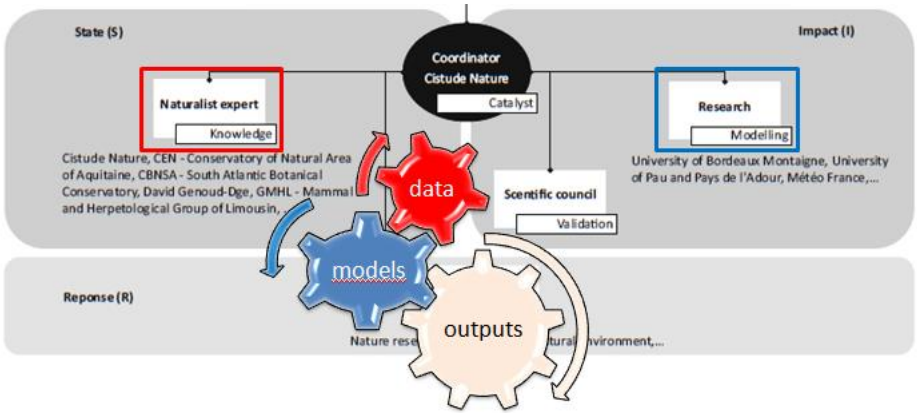
taking into account imperfection of detection

mechanistic models including:
+ ecological processes
+ ecophysiological traits
additional models of competition



improve model accuracy
➔ better SDMs outputs

* KERMORVANT C., D'AMICO F., BRU N., CAILL-MILLY N., ROBERTSON B. (2019). **Spatially balanced sampling designs for environmental surveys.** Environmental Monitoring and Assessment



mix of reproducible approaches (monitoring, experimental, modeling)

⇩

mandatory links between scientists and field observers communities, natural areas managers and decision-makers who implement environmental policies,

⇩

ultimately, civil society which guides societal choices.

www.sentinelles-climat.org

Photo : F. D'Amico ©