

# Of Mountains and Marmots : climate change in the French Alps



Réserve Naturelle  
GRANDE SASSIÈRE

Une étude sur la biologie et la sociologie  
des marmottes est conduite sous l'égide  
de l'Université de Lyon.

Les animaux sont capturés à l'aide  
de cages. Une fois pesés et  
mesurés, ils sont relâchés  
vivants sur le site.



Commissariat de la Réserve



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Afin de faciliter le travail des  
chercheurs, merci de rester sur la  
piste et de ne pas toucher aux pièges.

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# What is climate change?

Changes of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.



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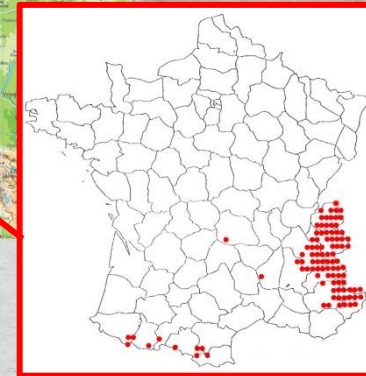
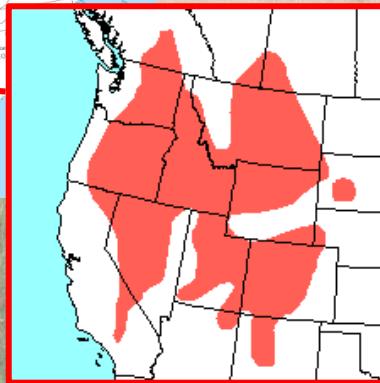


# Consequences on Marmot biology?

Yellow-bellied marmot  
(*Marmota flaviventris*)



Alpine marmot  
(*Marmota marmota*)



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Ozgul *et al*, 2010



Climate change = modification on  
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Alpine marmot  
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Tafari *et al*, 2013



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- Emerging earlier
  - Giving birth earlier = more time to grow between emergence and hibernation
  - Increase of body mass for all age classes
  - Better survive and reproduction
- Population growth





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Population growth

- Decrease of winter snow cover
- Over-consumption of marmots fat reserve during hibernation
- Skinier female
- Less pups produce

Population growth

# Why are the French Alps a good ecosystem to study climate change?

- Alpine ecosystems extremely sensitive to disruption
- Species extremely adapted to environmental conditions
- Confined to extreme habitats and can't migrate
  - Respond rapidly to climate change



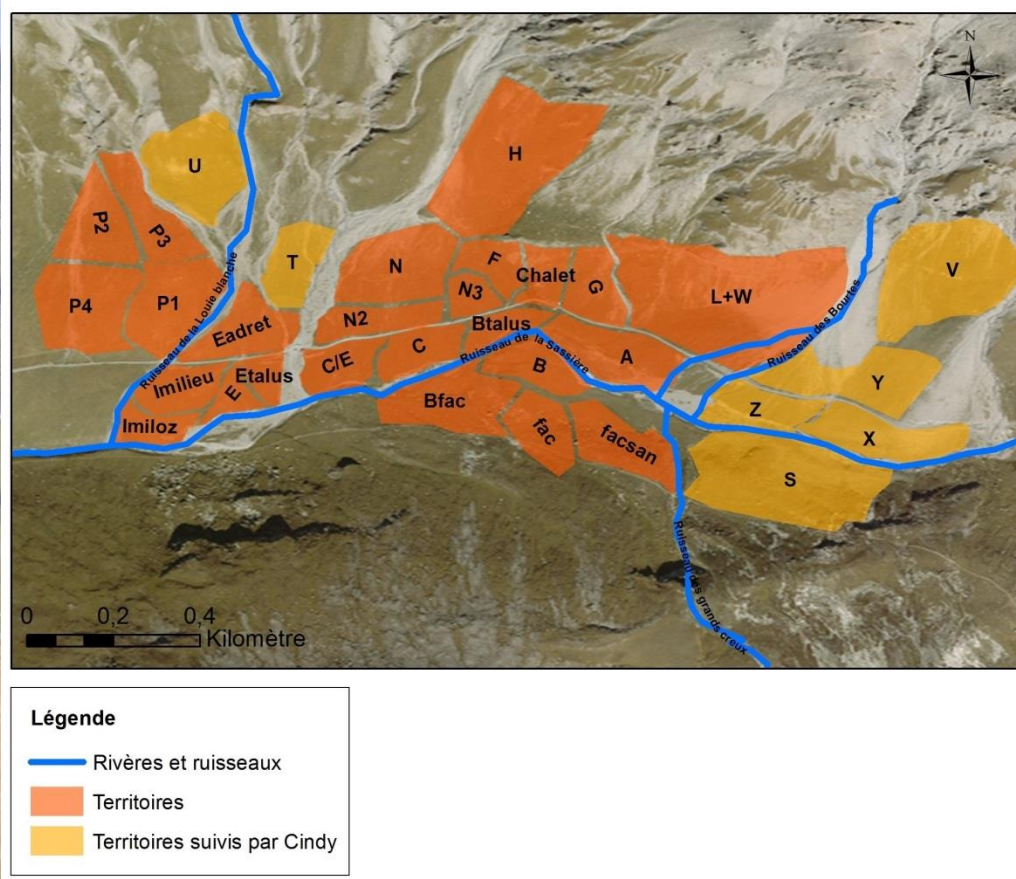
# Marmots monitoring :



= Good subject for modeling the impact on climate change in alpine fauna

- Hibernating species, adapted to Alpine ecosystem
- Lives in altitude between 800 and 3000 meters
- Complex social structure : single dominant couple, subordinates and pups
- Subordinates stay beyond sexual maturity within their natal group, helping parents to raise pups.
- Annual activity variable over time, depending on season

# Marmots monitoring :



Since 1990 :

- 32 marmots families studied
- 1300 individuals followed

# Marmots monitoring : captures

The marmot study, consist in :

- Trapping marmots



# Marmots monitoring : family counting

The marmot study, consist in :

- Trapping marmots
- Family counting



# Climate change monitoring in La Sassière



Weather station partly founded by Earthwatch volunteers

# How climate change affects marmots during hibernation?

- Monitoring temperatures variations inside burrows





# How climate change affects marmots during hibernation?

- Monitoring temperatures variations inside marmots
- How climate change affects marmot physiology



# How climate change affects ecosystems and marmots food?

- Monitoring plants flowering



Pasque flower  
*Pulsatilla vernalis*



Edelweiss  
*Leontopodium alpinum*



Cobweb Houseleek  
*Sempervivum arachnoideum*

# How climate change affects other species life cycle ?

- Monitoring frog and beetles reproduction



Grass frog

*Rana temporaria*



Green dock beetle

*Gastrophysa  
viridula*

# How climate change affects other species?

- Monitoring birds migration



Black redstart



Northern wheatear



Plastron blackbird



Eurasian crag  
martin

# Other activities

- Sociality monitoring : Helpers contribute to pups survival.
- How sociality will evolved with climate change?
- Reproduction monitoring = Capital parameters in population monitoring
- Behavioral observations
- Inside activities

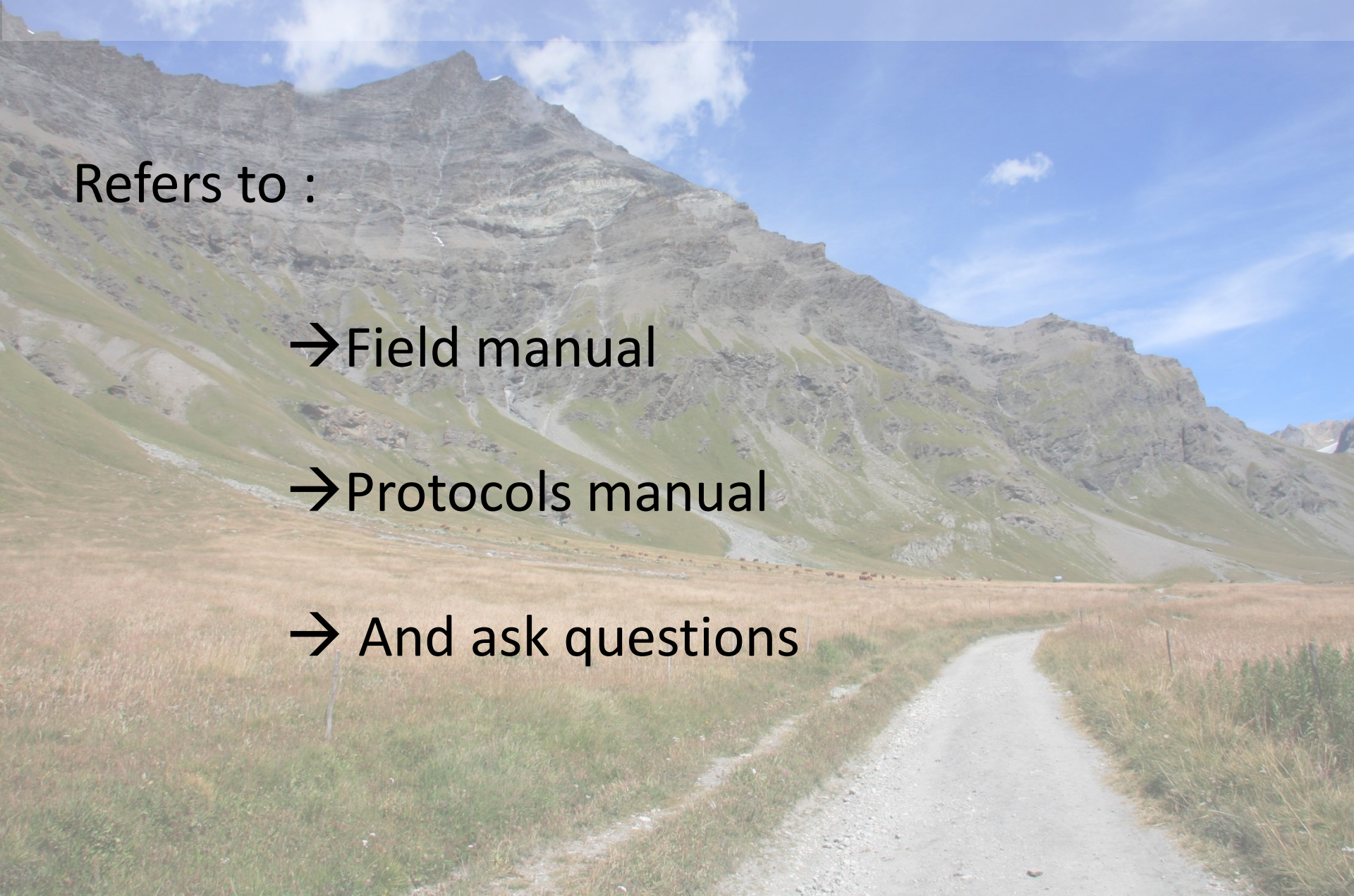
# More details ?

Refers to :

→ Field manual

→ Protocols manual

→ And ask questions



**Have fun and enjoy your time with us!**

