ROCKY MOUNTAIN OUTLOOK

# Pyrenees snow, water expert to share research in Rocky Mountains

By Lynn Martel - Rocky Mountain Outlook

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Over the course of his research in the European Alps and in the Pyrenees region of Spain, Dr. Juan Ignacio Lopez Moreno has learned that most land management practices may represent the most influential drivers of water availability in mountain regions where demography and economy have changed very quickly over the last few decades.

And, Moreno has learned, based on the evolution of river discharges observed over the past 50 years, the combined effects of increased vegetation and projected changes in climatic variables such as temperature and snow accumulation may ultimately cause serious problems for water supply in that particular region.



Based at the Pyrenean Institute of Ecology in Zaragoza, Spain, Moreno is a physical geography PhD with the department of Geo-environmental Processes and Global Change at the institute, which operates under the Spanish Research Council.

Pursuing his field of expertise of hydroclimatology in mountain areas, particularly in relation to environmental change such as changes in land cover and climate variability, Moreno manages four experimental catchments in the Pyrenees under different land uses and climatic

conditions. His studies involve making comparisons between the sites and observing how vegetation and climatic conditions influence the quantity and quality of water generated in mountain headwaters. His work also involves analysing the influence snow exerts on the hydrology of the Pyrenees. By conducting periodic snow surveys to measure the depth and density of snow at several sites, he combines the information he gathers by using computer snow models and remote sensing information to assess the amount of water resources stored in the snowpack that we be available as water the following spring.

Moreno will share the findings of his studies during his presentation, titled Environmental Change and Water Resources in the Pyrenees: Facts and Future Perspectives for Mediterranean Mountains, at Canmore Collegiate High School on Wednesday, Feb. 10. The talk is the second of the Canadian Rockies Snow and Ice Initiative Speaker Series, which brings some of the world's most respected hydrologists and glaciologists to Canmore and the Canadian Rockies to conduct research and share their discoveries.

"I am very happy to have the possibility to go to Canmore to present my work," Moreno said via email. "Beyond the science, mountains are my passion. I have the possibility to visit wonderful mountains, and at the same time to show to the audience the beauty of the Pyrenees. Moreover, I think that environmental changes observed in the Pyrenees are a very good example of how sensitive the hydrological response of mountains is. It implies that we need to understand the hydrology of these areas and also to remind us that any change induced by humans may have important consequences."

During his visit to the Canadian Rockies, Moreno will work with Dr. John Pomeroy, Canada Research Chair in Water Resources and Climate Change with the University of Saskatchewan, who is currently based in Canmore, to study different aspects related to snow accumulation and melting modelling in the Pyrenees.

Moreno's home region of the Pyrenees, the Ebro Valley, is absolutely dependent on the water

resources generated in the mountain, he explained.

“In the area where I live, we have only 250-300 millimetres of rain per year, so all the water used for irrigation, industry and domestic purposes comes from the mountains. In the last

decades, we have observed a number of environmental changes, particularly climatic variations and huge increases in vegetation that are already affecting the water yield of the headwaters. I think it is extremely important to understand how environmental change affects water

management for optimizing our resources and to have a good perspective about how climate and demographic projections may affect us in the near future.”

Despite the studies he and his predecessors have worked on, there remain several components of the Pyrenees’ water balance that are not fully understood, and for which insufficient data is unavailable, particularly those pertaining to the role of groundwater resources, water consumption by vegetation (actual evapotranspiration) or snow accumulation and melting processes.

When it comes to studying snow and water resources that originate in mountains, the topography often presents ongoing challenges for recording and collecting data, he said.

“In mountain areas, it is quite difficult to maintain all climatic and hydrological sensors working properly all the year, especially during winter,” Moreno said. “We have an experimental basin at

2,000 metres, and in winter it is necessary to walk three or four hours, or to take a helicopter to reach it. Thus, it is not easy to download the data, or repair some sensors that suddenly fail or to clean off snow when sensors or the solar panels are buried, as occurred last year with more than three meters of snow depth. Sometimes, it is also difficult to go for snow sampling under bad weather or snow conditions – although for me this is one of my favourite activities.”

Moreno said he looked forward to indulging that favourite activity while visiting some of the key hydrological monitoring sites in the Rockies.

“This is a great opportunity for me, since Spain has not a long tradition in snow studies, contrary to Canada where there are some of the best researchers on this topic,” Moreno said. “I am sure that I have a lot to learn during my visit, and I hope that it will be the beginning of a fruitful scientific cooperation.”

Dr. Juan Ignacio Lopez Moreno’s talk takes place on Wednesday, Feb. 10 at the Canmore Collegiate High School Theatre, starting at 7 p.m. Admission is free.



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