Recharge conditions of Mediterranean mountain karst aquifers. Consequences for resource protection and proactive management
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Mediterranean mountains are commonly made of carbonate rocks where karst processes acted for long time since the Miocene. Large, well developed, often multi-storey conduit systems are known everywhere, originating large karstic springs. These aquifers are recharged by direct infiltration of rain and snow melting above 1200-1500 m asl. The pluriannual hydrographs of some Lebanese springs, typical of Mediterranean mountain karst, were studied by means of correlation and spectrum analysis. Despite their location in the upstream part of main valleys, these aquifers, feeding karst springs, do not function as true karstic aquifers, showing a typical slow infiltration and a residence time longer a few months. For a start snow melting was suspected to delay the infiltration, because it is a recharge process long of some months, as shown when deciphering the signal. However field works showed that at its surface the karst is coated with a continuous cover of screes and slope debris resulting from the weathering of the epikarst especially by freezing, particularly during the cold phases of Quaternary. The consequence is a partial plugging of conduits in the infiltration and in the phreatic zones which delays the flow in a long infiltration phase, followed by a relatively long and slow baseflow phase. Among several consequences, two must be considered- i) the Mediterranean mountain karst aquifers may be generally well protected from fast infiltration and thus relatively resistant toward pollutions+ ii) any important work at the surface, scrapping the debris mantle, may change the infiltration conditions, then favouring fast infiltration and creating risks of pollution. Mediterranean mountain karst aquifers are interesting examples for proposing some engineering solutions for exploiting karst groundwater resources.