Geophysical Research Abstracts
Vol. 20, EGU2018-13913, 2018
EGU General Assembly 2018

Leonardo da Vinci's conceptualisations of the water cycle

Laurent Pfister

Luxembourg Institute of Science and Technology, ERIN, Catchment and eco-hydrology research group, Esch-sur-Alzette, Luxembourg (laurent.pfister@list.lu)

Even though more than 500 years lie between contemporary hydrology and Leonardo's concepts on the hydrological cycle, the study of his notebooks reveals interesting similarities between now and then (Pfister et al., 2009). Leonardo's interest in studying water had multiple reasons. In his childhood he had witnessed flood events and he later described them as the most terrifying disasters threatening humans and their buildings (Codex Atlanticus). In his notebooks he advocated the 'science of water' and considered that gaining a mechanistic understanding of how floods are triggered as a prerequisite for designing and implementing protective measures for human life and infrastructures.

Despite considerable progress that has been made – in particular over the last century – hydrology remains a very young field of science. This may be part of the reason why recent initiatives have focused on inventories of research made over the past decades and centuries – essentially as an expression of a desire to better assess where we stand today and define strategies to tackle the challenges that lie ahead of us.

In this context, the work of Leonardo da Vinci clearly stands out, and he may well be considered one of the founding fathers of hydrology. From this perspective, the origin of modern hydrology goes back to the sixteenth century. Leonardo indeed produced an impressive number of writings on his observations and conceptualisations of the water cycle. As an exponent of the Renaissance, he also stands for a clear paradigm shift – away from a dominant religion-centred paradigm of the Middle Ages to the science-centred paradigm, based on empiricism and deduction.

Leonardo da Vinci wanted to gain a better mechanistic understanding on what makes water circulate. Observations were key to him in this respect, as he stated that 'whenever speaking about water, you have to keep in mind that you first have to invoke experience, before reasoning'. He would define precise questions such as 'why water is moving and why its movement stops; why it is slowing down, or accelerating, and how it moves upward in the air, under the effect of solar heat and then falls down as rain'.

Leonardo ultimately proposed a concept for the water balance, relying on inputs and outputs of hydrological systems: 'throughout a year, the amount of water that is elevated (to the top of the mountains), equals the amount of water that descends (back to the sea) via the rivers and the air (atmosphere)'. What reads like an obvious statement nowadays is nothing less than the main tenet of scientific hydrology. After Leonardo's early conceptualisation it took a very long time before the emergence of the modern concept of the water cycle, stipulating that inflows to any area of any period of time shall always equal outflows in addition to the change in water storage.

Pfister L., Savenije H.H.G., Fenicia F., 2009: 'Leonardo da Vinci's water theory – On the origin and fate of water'. IAHS Special Publication 9. IAHS Press, Wallingford, UK. 94 p.