Effects of energy price variability on streamflow in the Adige catchment (Italy)

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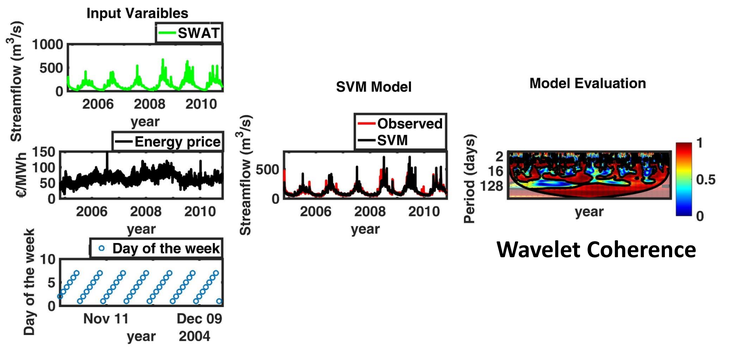
1. Introduction

Water management in the alpine region has an important impact on streamflow. In particular, hydropower production is known to cause fluctuations in river stage caused by the release or storage of water in artificial reservoirs with important consequences for the environment.

Our work:

- We couple a calibrated hydrological model with a machine learning method
- We evaluate model performance using wavelet coherence analysis
- We show that the knowledge of energy price fluctuations is fundamental to capture streamflow variability at short temporal scales

2. Methods



Wavelet coherence (WTC) can be used to identify the scales where two time series focus on the power and how this may change in time (Grinsted et al., 2004; Torrence and Compo, 1998). An intuitive interpretation of wavelet coherence is as a generalization of the squared cross-correlation coefficient r^2 between the signal content of the two time series in the scale-time space. Similar to the classical correlation coefficient, high coherence values (close to 1) are displayed for the time windows and scales in which model and observations are highly correlated, while values close to 0 indicate low coherence.

Highlights

- Streamflow displays high coherence with energy price, particularly during winter
- Coupling of hydrological model and support vector machine (SVM)
- Coupled model can reproduce anthropogenic influences on streamflow
- SVM was trained using the day of the week, energy price and SWAT model results
- Coupled model displays the highest coherence with the observation at 3-7 day scales

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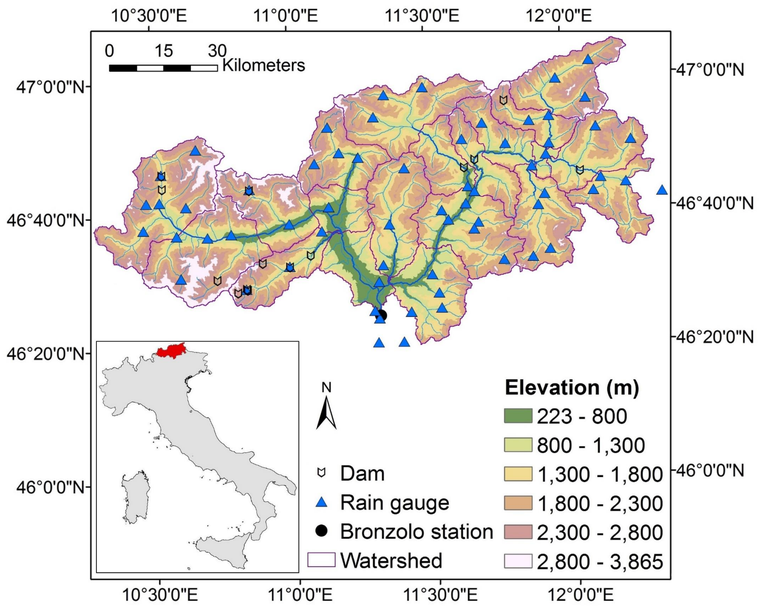
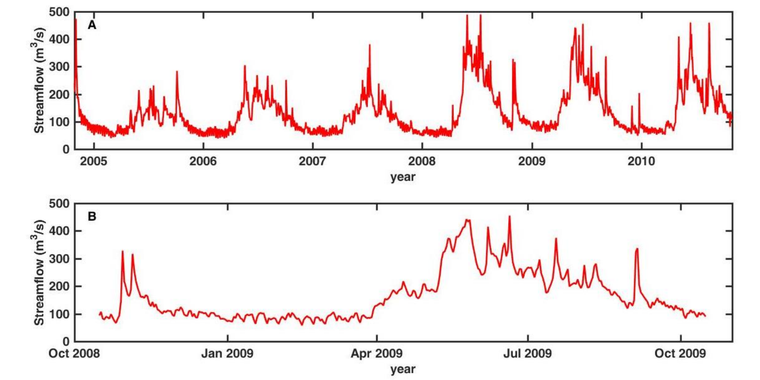
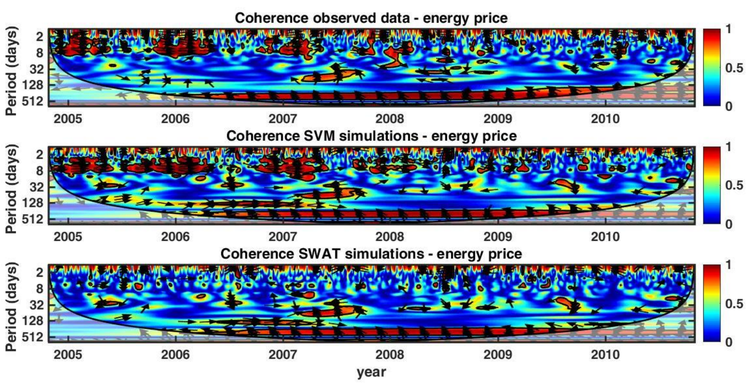
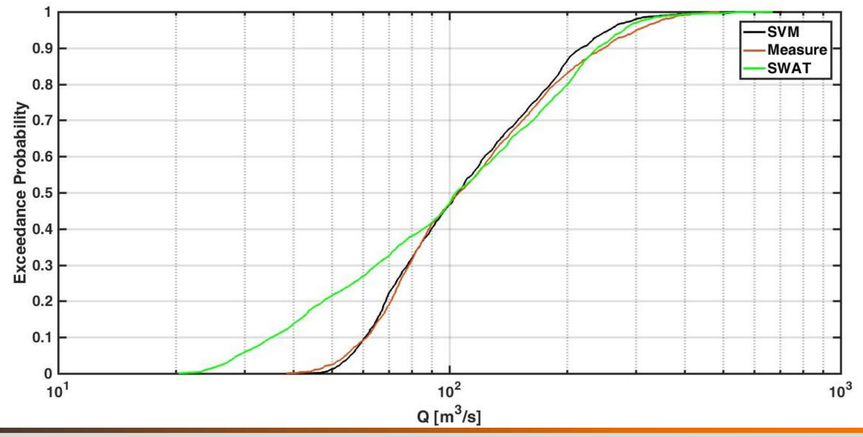
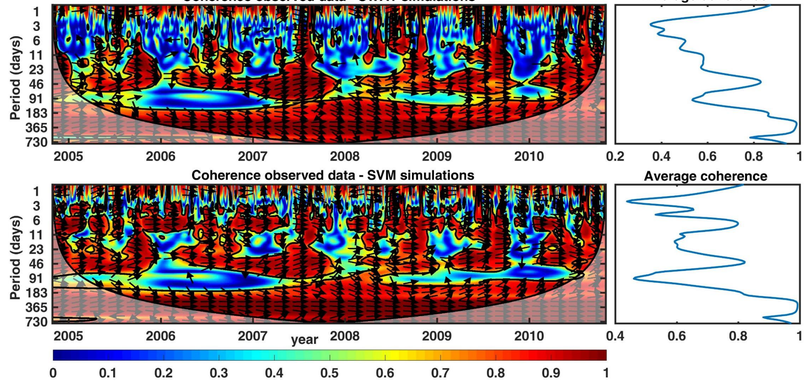




3. Results







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