Effusion rate and flow volume are important controls on lava flow morphological parameters and flow length. The distance that a flow travels ultimately depends both on the eruption rate and on the duration of the eruption. Therefore, techniques capable of measuring effusion rates during an eruption are of particular value in hazard prediction, warning, and risk mitigation. Effusion rates are commonly estimated using high-temporal/high-spectral/low-spatial resolution data from multispectral payload such as AVHRR and MODIS. Starting from a seven-year long time series of satellite-derived effusion rates at Mt. Etna, Italy, we want to perform the data extraction of hidden predictive information using supervised machine learning techniques. These techniques are commonly used in Data Mining at the aim of discovering and identifying recurrent patterns by analyzing huge amount of data. The Support Vector Machine (SVM) is a Kernel-based supervised machine technique that represents a major development in machine learning algorithms and has been successfully used in many domains of practical interest. Herein, using a time-series of effusion rate, SO2 flux, and seismic data, we train a SVM in order to build a prediction model for the Etnean lava effusion rates during the progress of the eruption. Our goal is to calculate the predicted probability of effusion rate within short temporal windows from the beginning of the eruption. After an accurate cross-validation procedure to estimate the best optimization parameters, we obtained a prediction model with an accuracy of 86% for the effusion rate by considering a temporal window of one week.