

PREFACE

Mount Etna, located on the eastern coast of Sicily, Italy, stands as one of the world's most active and captivating volcanoes. Its majestic presence has shaped the surrounding landscape and influenced the lives of those in its vicinity. However, the dynamic nature of this volcanic giant also poses significant hazards to the local communities. In recent years, the increasing frequency and intensity of volcanic activities at Mount Etna have underscored the urgent need for practical hazard analysis and emergency preparedness. Understanding the complex nature of volcanic hazards and developing robust evacuation plans are paramount in safeguarding human lives and minimizing the potential destruction caused by eruptions. This study delves into the realm of geospatial analysis. It explores the use of Geographic Information Systems as a powerful tool for mitigating volcanic risks through a comprehensive examination of Mount Etna's volcanic hazards and implementing GIS technologies that aim to contribute to volcanic risk assessment and emergency management. Each chapter presents a multidisciplinary approach, combining geological studies, hazard mapping, remote sensing techniques, and GIS methodologies that helped in making practical insights and innovative strategies to assess volcanic hazards and plan effective emergency evacuation routes. The software used for the process is ArcGIS Pro 3.1, SNAP Desktop tool, Q-GIS, Google Earth Pro, and AGOL. The data collection process involves pre-processing and post-processing of the Sentinel-1A SAR data. Pre-processing steps include selecting the appropriate data acquisition mode, dividing the product's swath, and applying an orbit file for precise orbit correction. Post-processing steps include co-registration, interferogram generation, de-bursting, topo-phase removal, Snaphu unwrapping, and Snaphu import for displacement calculation. These steps help analyze the vertical displacement derived from InSAR (Interferometric Synthetic Aperture Radar) and provide insights into surface deformation and changes. The Q-LavHA freeware plugin for QGIS is used for lava flow inundation simulation. In addition to the analysis of volcanic data, the study also involves the use of ArcGIS Online (AGOL) for evacuation route mapping and geo-enrichment.