Abstract

The western sector of the Calabrian Arc is considered a classic extensional domain that developed as a result of subduction rollback and related back-arc opening since Late Miocene times.

However, the development of the back-arc domain is controlled by major strike-slip faults related to the heterogeneous nature of the Adria lithosphere and accommodating the SE migration of the Calabrian Arc. Since Middle Miocene to Lower Pleistocene, en-échelon NW-SE oriented left-lateral strike-slip faults exerted a major control on the tectonic evolution of northern-central Calabria. A series of extensional basins also developed in the area since the Plio-Pleistocene, being linked with, and segmented by these strike-slip faults.

The Crati Basin developed in the northern portion of the Calabrian Arc, being filled by Tortonian to Lower-Middle Pleistocene marine to deltaic deposits. Strike-slip faults and associated shortening at contractional jogs affected the basin fill during the early stages of its evolution. Since the Middle Pleistocene, N-S striking normal faults began to form, controlling the basin architecture.

The tectonic evolution of the Crati Basin has been investigated by the integration of field mapping, the construction of geological cross sections and bio-stratigraphic analyses with the interpretation of 2D seismic data. Seismic interpretation, used to constrain the structure of the basin at depth, confirmed that the master fault of the extensional fault system controlling the Crati Basin is represented by a blind fault dipping towards the west. This indicates that the Crati Basin may be interpreted as a half-graben that formed since...
Middle Pleistocene time. A minimum value of cumulative vertical displacement of ca. 600 m has been unraveled for the central sector of the Crati Basin since Middle Pleistocene times. This yields a vertical strain rate of ca. 0.9 mm/y during the last 700 ka.

Normal faults started to develop in the southernmost sector of the basin, where they abut against pre-existing strike-slip faults. It is envisaged that strike-slip faults, becoming progressively inactive and working as persistent barriers, inhibited the propagation towards the south of the newly formed normal faults, which therefore propagated towards the north, where such barriers were absent.
Controls of structural inheritance in normal fault propagation and extensional basin segmentation: the Crati Basin, northern Calabria, Italy.

Introduction

The present work focuses on normal fault propagation and the development of extensional basins in the Northern Calabria region, which is characterized by a complex tectonic setting involving the Variscan fold belt, the Apenninic-Maghrebian system, and the recent, post-Miocene tectonic events. The study area includes the Crati Basin, a major extensional basin located in the northern Calabria region of Italy, which has been subjected to significant tectonic activity over the past 40 million years.

Regional geological setting

The Crati Basin is a foreland basin developed in the western sector of northern Calabria, characterized by a series of tectonic elements including normal faults, thrust faults, and strike-slip faults. The basin is bounded by the Cilento Mountains to the east and the Tyrrhenian Sea to the west. The basin fill consists of a thick sequence of sediments ranging from the Late Miocene to the present, and includes a variety of depositional environments such as fluvial, deltaic, and marine.

Basin stratigraphy

The basin fill is divided into several stratigraphic units, including the Miocene-Pliocene sequence, the Pleistocene-Holocene sequence, and the Quaternary sequence. The Miocene-Pliocene sequence consists of a thick sequence of sediments that accumulated in the basin during the Miocene and Pliocene periods. The Pleistocene-Holocene sequence consists of a younger sequence of sediments that accumulated during the Pleistocene and Holocene periods. The Quaternary sequence consists of a thin sequence of sediments that accumulated during the Quaternary period.

Structures

The basin fill is characterized by a series of structural elements, including normal faults, thrust faults, and strike-slip faults. These structural elements have played a significant role in the development of the basin and the distribution of sedimentary deposits. The normal faults have been active throughout the history of the basin, and have controlled the distribution of sedimentary deposits. The thrust faults have also been active, and have played a role in the development of the basin's structural framework. The strike-slip faults have been less active, and have played a minor role in the development of the basin's structural framework.

Legend

- **R**: Rift basin
- **F**: Fault
- **S**: Sedimentary fill
- **P**: Precambrian basement
- **C**: Carbonate plateau
- **T**: Thrust fault
- **D**: Delta
- **M**: Mountain range
- **W**: Water body

Fig. 1. Palaeogeographic map of the Crati Basin (Miocene-Pliocene) showing the main structural elements and sedimentary deposits. The map also includes a cross-section of the basin illustrating the distribution of sedimentary deposits.

Fig. 2. Geologic map of the Crati Basin (Pliocene-Holocene) showing the main structural elements and sedimentary deposits. The map also includes a cross-section of the basin illustrating the distribution of sedimentary deposits.

Fig. 3. Geologic map of the Crati Basin (Quaternary) showing the main structural elements and sedimentary deposits. The map also includes a cross-section of the basin illustrating the distribution of sedimentary deposits.
Subsurface data

Some subsurface data are available on the CB. Slightly more is now being developed for an area of subsurface sedimentary formations. It is suggested that this data be used to better understand the stratigraphy and structure of the sedimentary formations. However, the data are not complete and more work is required to better understand the subsurface geology.

Discussions

Based on the presented data, we propose a new interpretation for the CB. It is suggested that the subsurface sedimentary formations are divided into two main layers: a lower layer of consolidated sediments and an upper layer of unconsolidated sediments. The lower layer is characterized by a more heterogeneous composition, while the upper layer is more homogeneous.

The lower layer is composed of a sequence of alternating layers of sand and mud, which are thought to have been deposited in a shallow marine environment. The upper layer is composed of a sequence of alternating layers of clay and silt, which are thought to have been deposited in a deeper marine environment.

The tectonic setting of the CB is characterized by a series of faults and folds, which have had a significant influence on the subsurface geology. The faults have led to the development of a series of structural highs and lows, which have controlled the distribution of the sediments.

The subsurface data suggest that the CB is a complex geological structure, with a series of interconnected fault systems. The tectonic setting of the CB is characterized by a series of faults and folds, which have had a significant influence on the subsurface geology. The faults have led to the development of a series of structural highs and lows, which have controlled the distribution of the sediments.

The data presented in this paper suggest that the CB is a complex geological structure, with a series of interconnected fault systems. The tectonic setting of the CB is characterized by a series of faults and folds, which have had a significant influence on the subsurface geology. The faults have led to the development of a series of structural highs and lows, which have controlled the distribution of the sediments.

Conclusions

The data presented in this paper suggest that the CB is a complex geological structure, with a series of interconnected fault systems. The tectonic setting of the CB is characterized by a series of faults and folds, which have had a significant influence on the subsurface geology. The faults have led to the development of a series of structural highs and lows, which have controlled the distribution of the sediments.