

Orthodox Churches of Lalibela

Engineering geological conditions and problem:

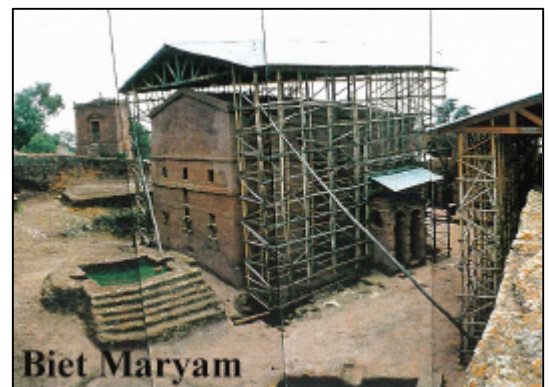
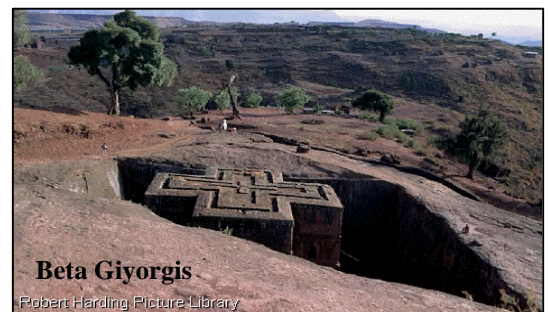
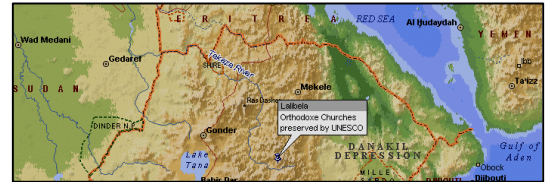
In the 12th century King Lalibela of [Ethiopia](#) constructed a series of 11 [churches of pure rock](#). [They are excavated in volcanic weather materials, at the contact between basalt and tuff](#). Their roofs are at ground level, and each structure is surrounded by a trench 12 metres (40 feet) deep. With intricate details carved into the walls, elaborate windows, ledges, and ridges, the structures appear to be built of brick. Each church includes an elaborate system of trenches, passageways, and drainage tunnels. Pilgrims and tourists come from all over the world to see the churches or to take part in various religious festivals. The rock-hewn churches at [Lalibela](#) were designated a [World Heritage Site \(UNESCO\)](#) in 1978.

Damages:

- Geotechnical instability of underground structures
- Indoor humidity
- Penetration of rainwater from the joints of the roofs
- Damage of paints

Protection measures already taken or have to be taken:

- Geotechnical and static stability analysis
- Waterproofing of the roofs
- Weathering protection of the walls
- Conservation of frescos



Other information:

A preservation project, coordinated by the [European Commission](#) and funded by the [World Bank](#) is already scheduled. In this project geological, hydrogeological geophysical, engineering geological, static, architectural and archaeological studies are included.

EU Coordinator for the scheduled preservation activities: Dr. An. Zacharas (EU Officer)

EU Scientific Committee for the scheduled preservation activities:

Bureau d'Architecture ACEL s.p.r.l. et MELETITIKI A. N. Tombazis Ltd (G. Morozzo, Dr Chr. Boissavy, **Prof. B. Christaras**, Prof. P. Laureano, Prof. Cl. Lepage, Prof. L. Pressouyre)

References on studies already performed:

Lepage Cl. (1997): Une origine possible des eglises monolithiques de l'Ethiopie Ancienne. Acad. Sch. Inscr. & Bel. Letr., compte rendus seances 1997, Paris, pp. 199-212.

G. Morozzo, Dr Chr. Boissavy, **Prof. B. Christaras**, Prof. P. Laureano, Prof. Cl. Lepage, Prof. L. Pressouyre (1999): Term of Reference for the preservation of the churches of Lalibela. European Commission.