



ROADS IN THE SAND

Using the modern travelers' data for reconstructing the road networks of the ancient Eastern desert of Egypt

Maël Crépy, Louis Manière, Bérangère Redon



« Desert Networks. Into the Eastern Desert of Egypt from the New Kingdom to the Roman period »
ERC funded project – Starting Grant (2017-2022, Proposal number 759078)



The ambivalent nature of a long-studied area

A dangerous zone



Hyper-arid desert



Snake



Scorpio



The God Min



A Blemmye



Peaks of occupation:

- New Kingdom (second half of the 2nd mil. BC)
- Ptolemaic period (331-30 BC)
- Early Roman Empire (30 BC-late 3rd c. AD)

Rich in natural resources



Granite



Gold

A gate to Arabian, African and Indian worlds



Incense



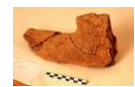
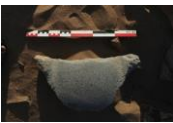
Pepper



Elephant



An extremely rich and varied heritage



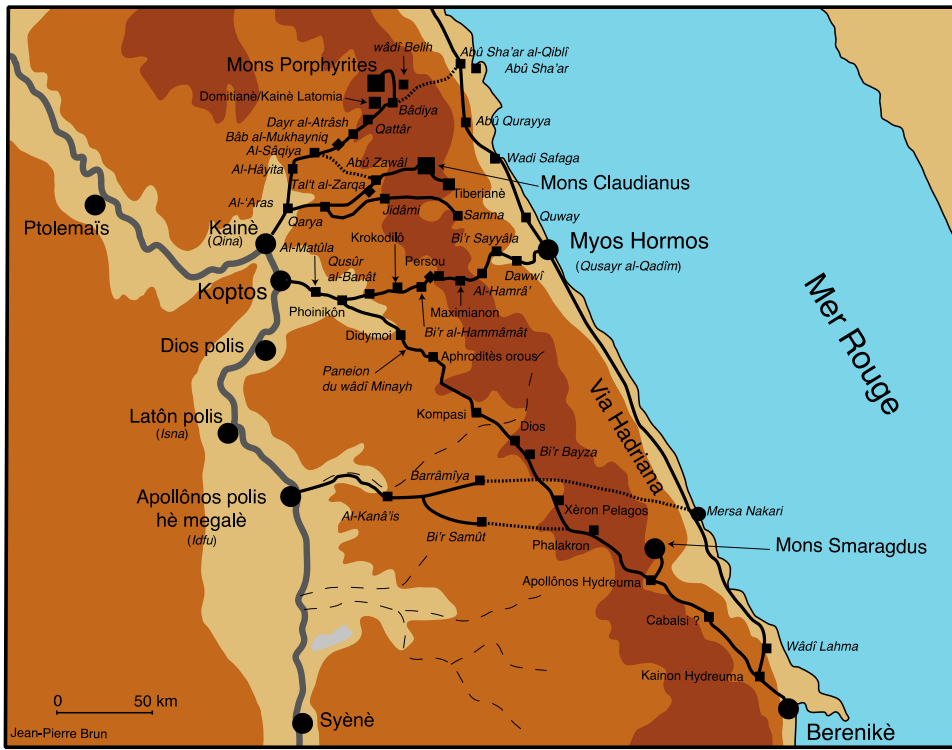


Brief summary of the “Desert Networks” project (2017-2022)

- **Assumption**
 - one cannot cross the desert and survive alone; sites and persons were likely interconnected
- **Aims**
 - writing a global history of the Eastern Desert from Pharaonic to Roman times, focused on the dynamics of the desert
 - Creating an online atlas of the Eastern desert sites, fully accessible and searchable
- **Heuristic concepts**
 - network approach in line with the connectivity theory of Purcell and Horden, enhanced by Malkin
- **Methodology**
 - on the *longue durée*, by confronting the whole archaeological material and written evidence
- **Research topics**
 - **Physical networks:** reconstruct the layout of the ancient roads and better understand the reality and perceptions of ancient routes through spatial analysis
 - **Economic networks:** situate Roman economic practices within a diachronic picture and ask questions about the economy of the region at different scales
 - **social networks:** decipher the personal networks of men and women who lived or passed through the desert, using the methodological tool of social network analysis (SNA).

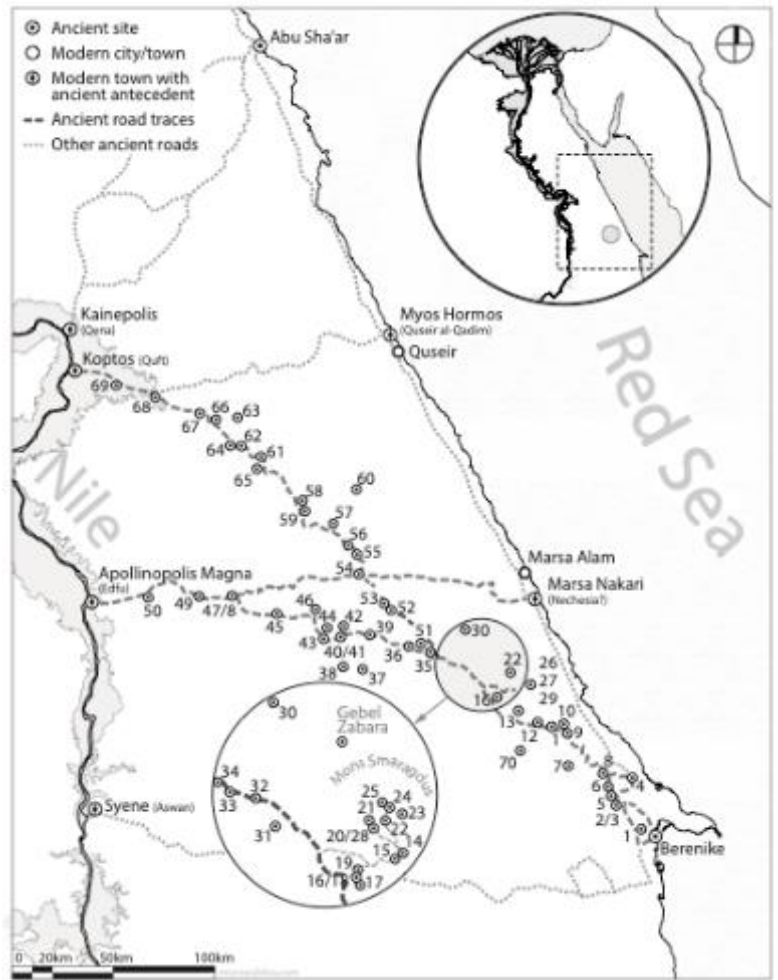


Reconstructing the Eastern desert roads: from classical approaches to GIS



● Agglomération antique ■ Fort antique ◆ Station antique non fortifiée — Piste antique Piste hypothétique

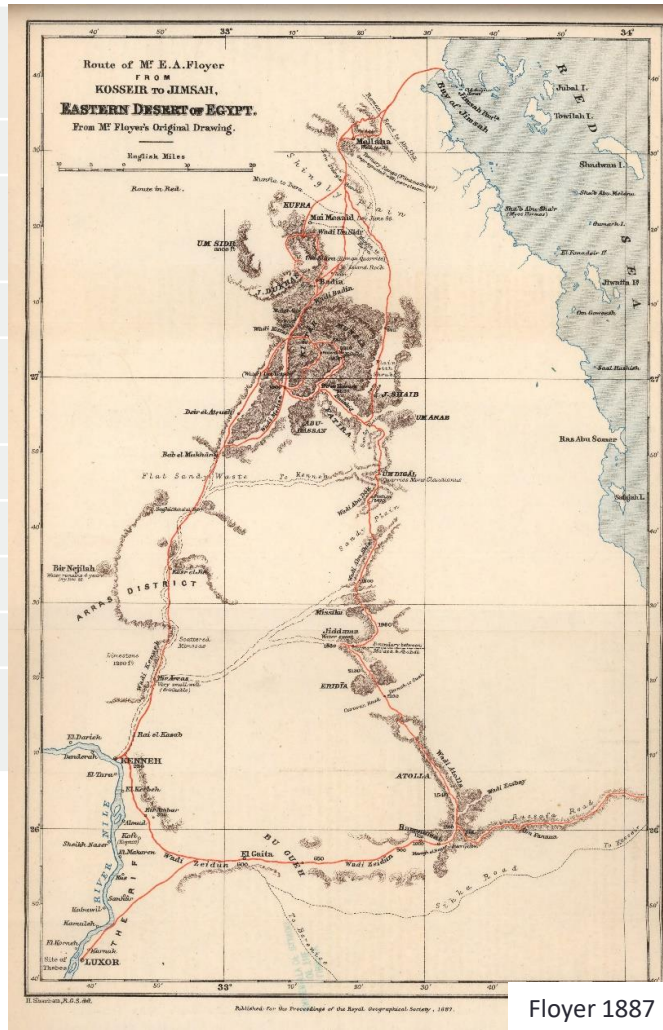
Brun 2018



Sidebotham, Gates-Foster 2019

Travelers and travel accounts

| Author | Date of publication | Aim of the travel | Used for |
|--------------------|---------------------|----------------------------|------------|
| Denon | 1802 | Military operation | Control |
| De Rozières | 1813 | Military operation/geology | Control |
| Belzoni | 1820 | Exploration/archaeology | Time |
| Flaubert | 1910 (1850) | Sightseeing | Control |
| Du Camp | 1860 | Sightseeing | Control |
| Colston | 1887 | Exploration | Time/Route |
| Floyer | 1887 | Exploration | Control |
| Cuyat | 1910 | Archaeology/geology | Route |
| Bisson de la Roque | 1922 | Exploration | Time/route |



Floyer 1887

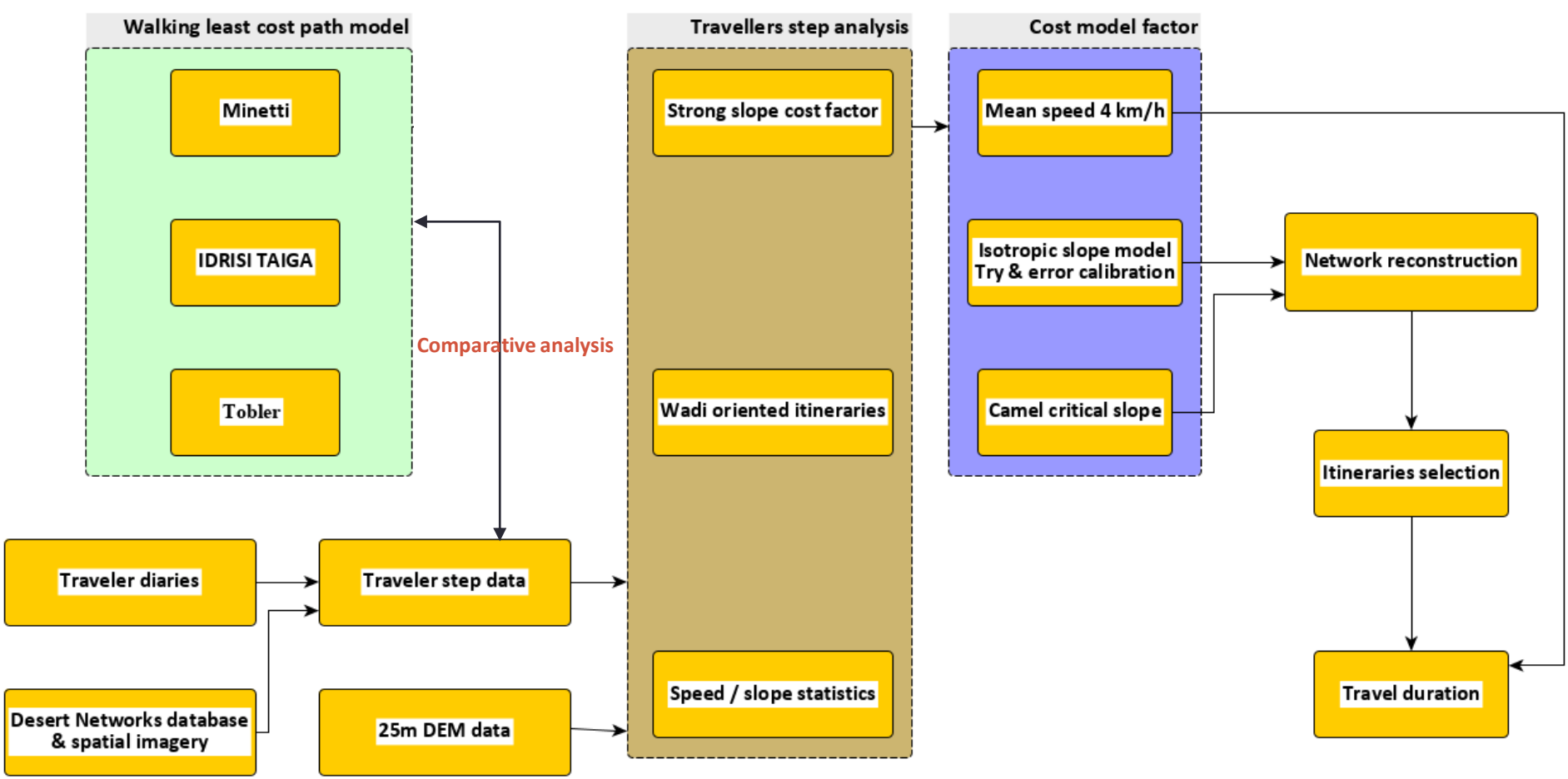


Macalister 1900



Design of the least cost path model

Ancient camel caravan (Ptolemaic & Roman periods) travel modelling from modern camel travels



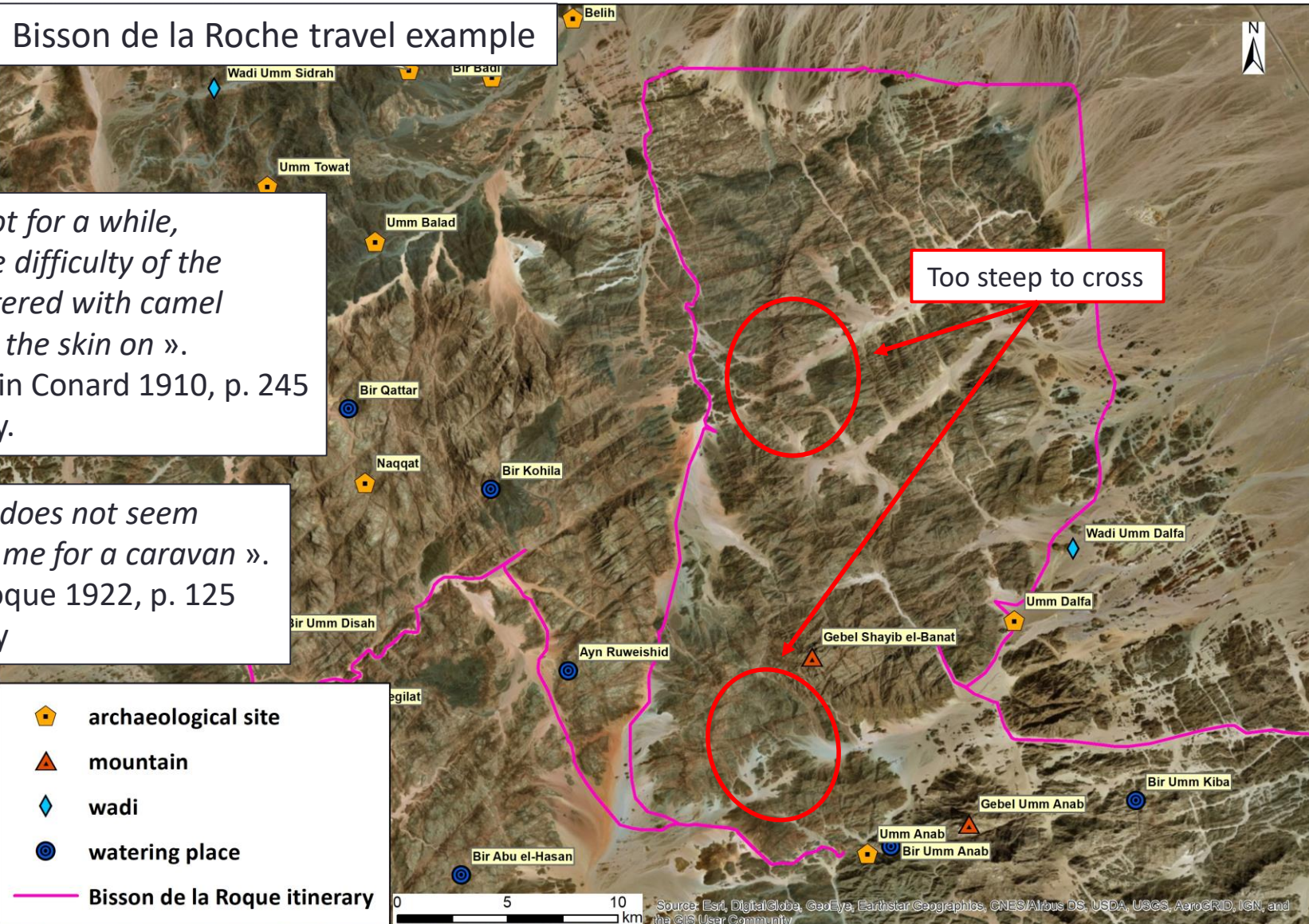


Analysis of the travelers' steps: a strong slope cost factor

Bisson de la Roche travel example

« We go on foot for a while, because of the difficulty of the road; it is scattered with camel carcasses with the skin on ».
Flaubert 1850 in Conard 1910, p. 245 trans. M. Crépy.

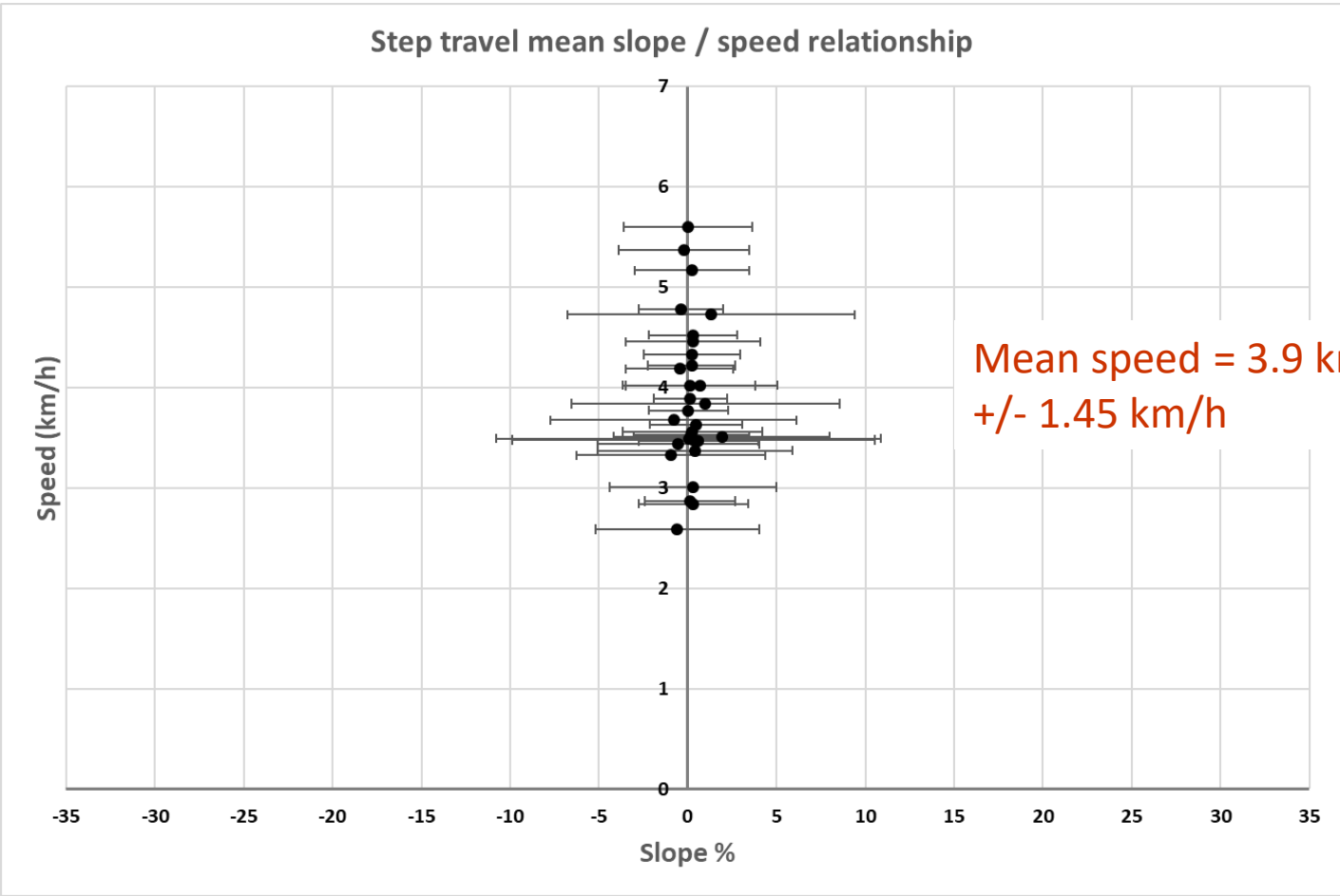
« This descent does not seem practicable to me for a caravan ».
Bisson de la Roche 1922, p. 125 trans. M. Crépy



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Analysis of the travelers' steps: a strong slope cost factor



Slope usually between +/- 5%
Rarely above 10%



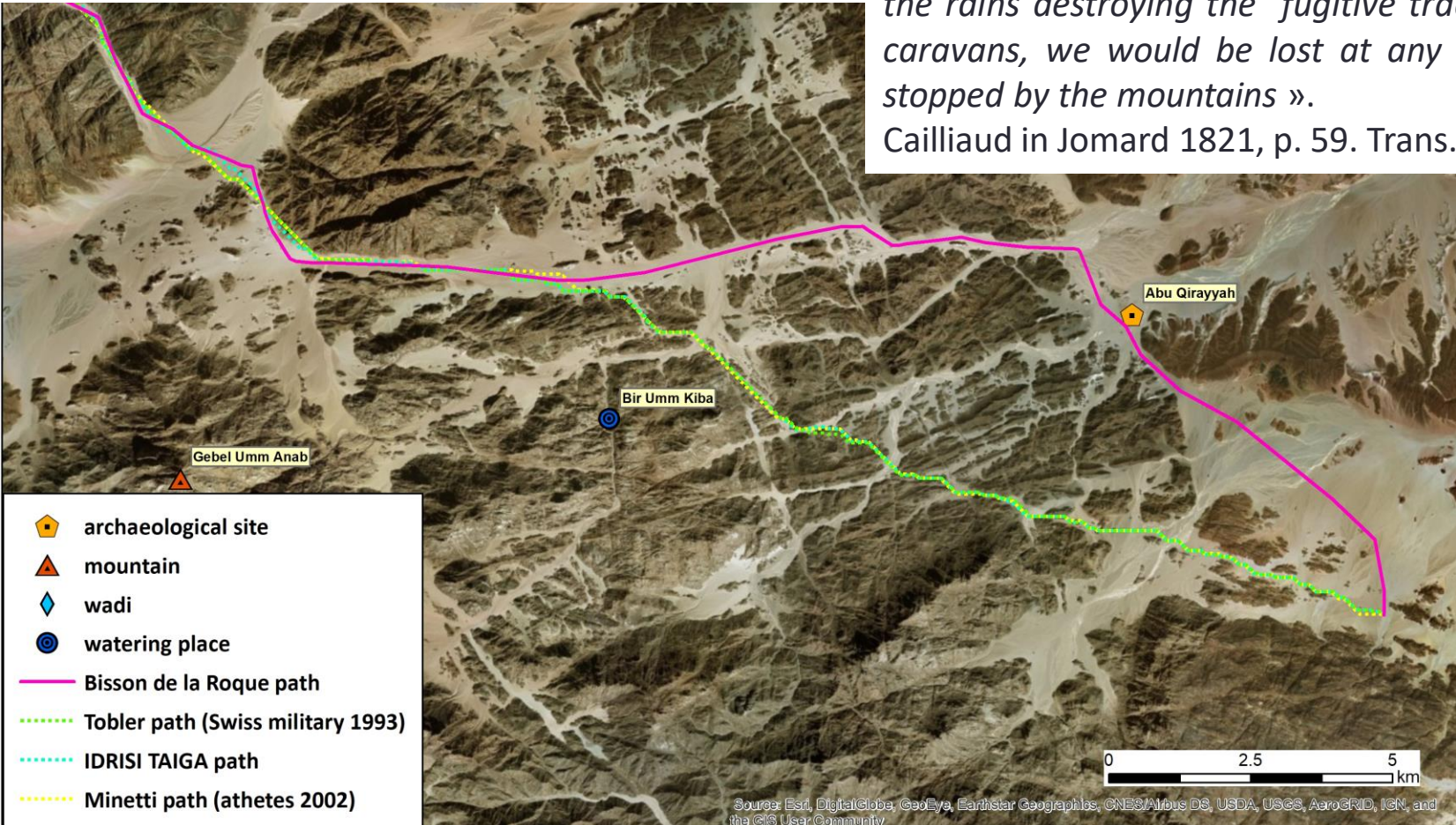
Comparative analysis with common walking least cost path models

Wadi oriented paths

- Easy slope for heavily loaded camel
- Cohesive sandy or gravelly walking surface
- Geographic references for orientation (day/night)

« A pyramidal masonry pile, placed on the top of the two mountains that border these roads, serves to distinguish them. The one on Mount Zabarah in the east is also marked in many places; without it, the rains destroying the fugitive traces left by the caravans, we would be lost at any moment and stopped by the mountains ».

Cailliaud in Jomard 1821, p. 59. Trans. M. Crépy

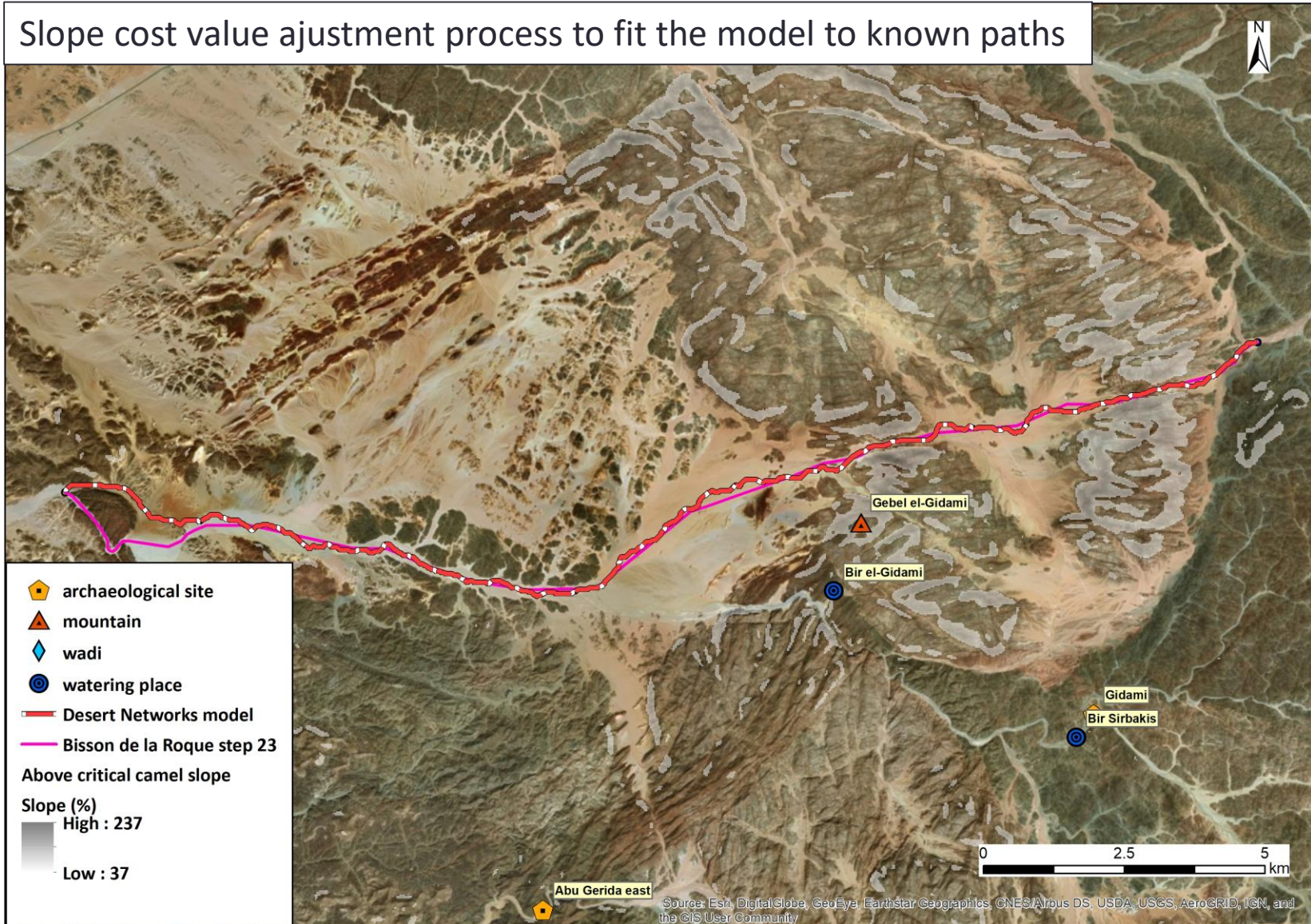


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Slope calibration

Slope cost value adjustment process to fit the model to known paths

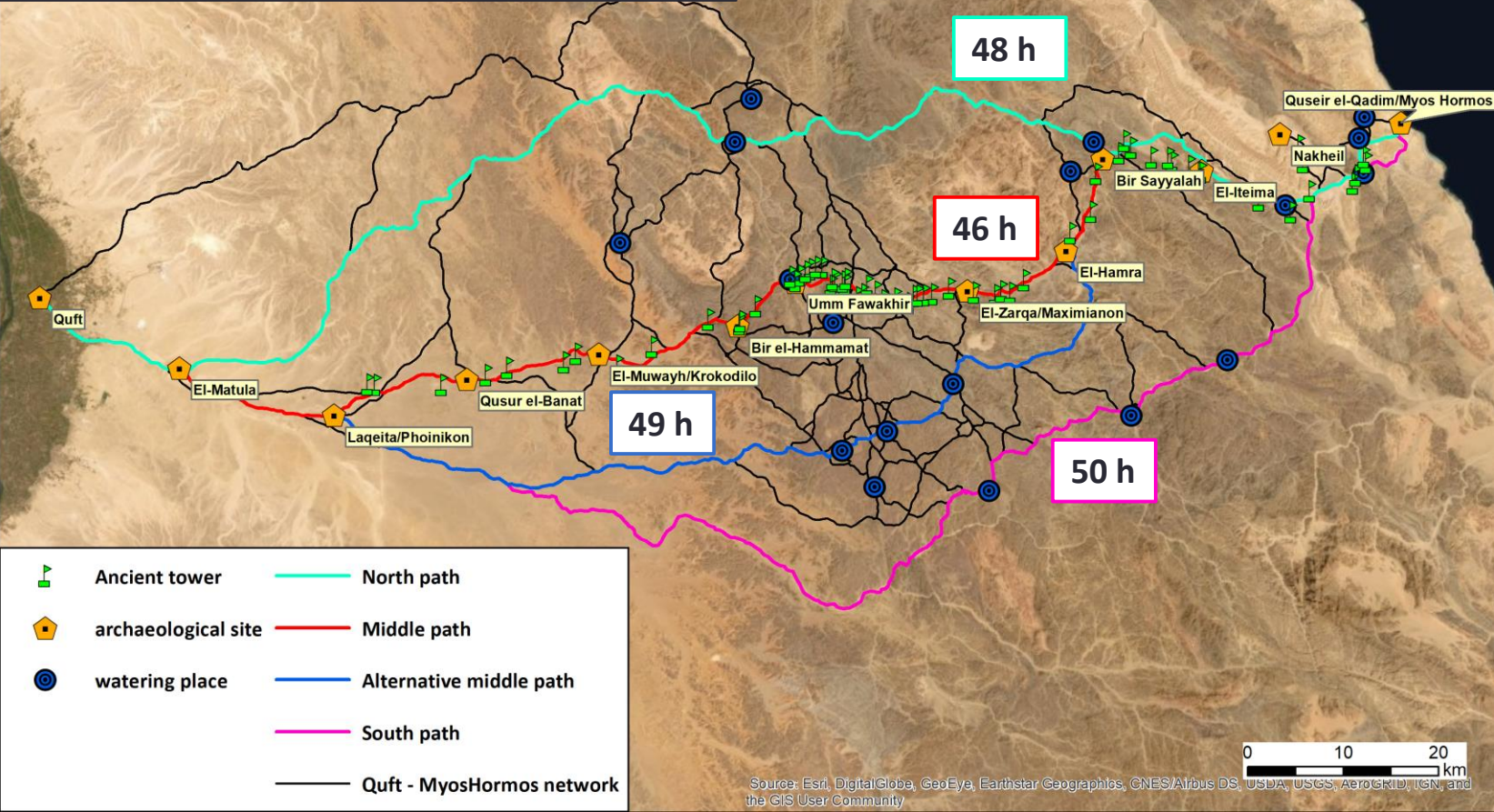




Network simulation

Model application to link the known archaeological sites for a specific period and watering places

Coptos (Quft) - Myos Hormos network
Roman period (late 1st- early 3th c. AD)





Application and validation

Alternative routes from Abu Midrik to Abu Rahal

Probable route according to Sidebotham Gates-Foster 2019

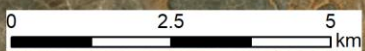
Cairn for travelers' orientation

Cairn presence?
Need field validation

- ▲ Cairn
- Archaeological source road
- Ancient road traces
- - - Probable routes
- Actual model design road
- 🏠 archaeological site
- ⚠️ mountain
- 💧 wadi
- 🕒 watering place



© Alexandre Rabot, 2017



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Improvement & conclusion

Improve the wadi oriented path by remote sensing analysis

- Cohesive sandy walking surface better than bedrock
- Geographic references for orientation

Other modes of transportation

- Donkey (New Kingdom)
- Horse (Roman period)

Potential use of modelled routes

- Identify other factors for route choices during ancient times
- Field survey along the routes

