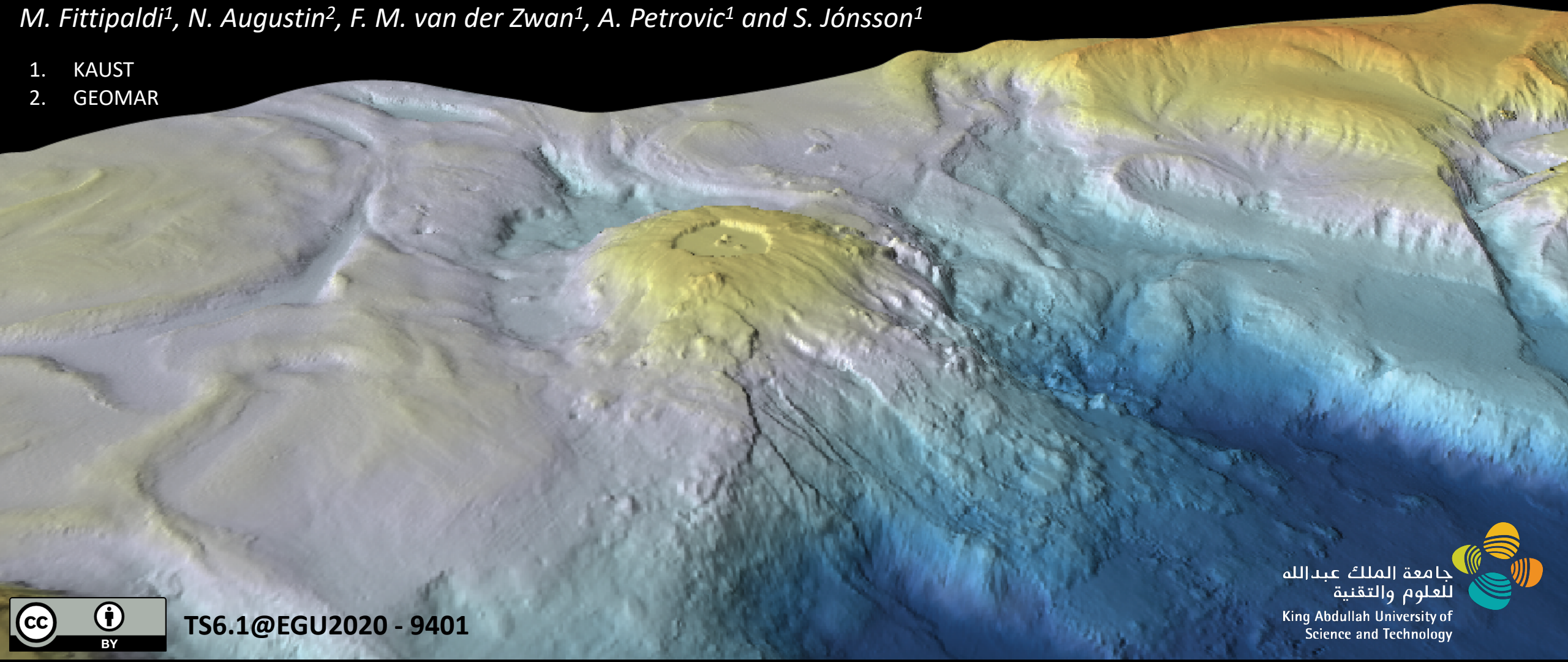


Tectonics of the Northern Red Sea, insights from multibeam bathymetric mapping of Mabahiss Deep

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- Red Sea axis structure:
 - **North**: rare deeps, poorly defined axis
 - **Centre**: deeps with oceanic crust + inter-deep zones
 - **South**: continuous axial valley
- ZFZ:
 - the largest **Red Sea axis offset** (~100 km)
 - **persistent seismicity**

AIMS & OBJECTIVES

What is the Red Sea axis structure north of the ZFZ?

Does mid-ocean rifting continue north of the ZFZ?



1) Identify the key structural features of the Mabahiss area, just north of the ZFZ

2) Compare Mabahiss structures to the Red Sea axis south of the ZFZ

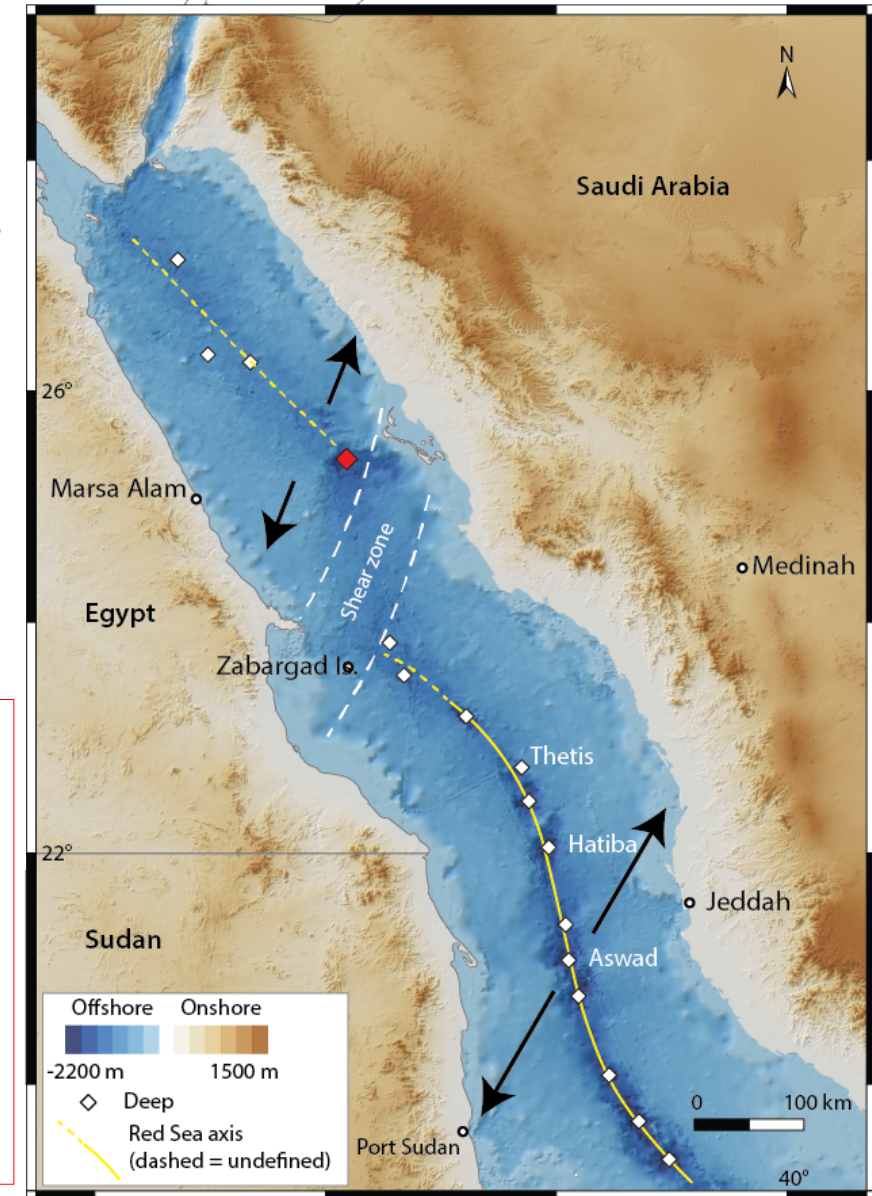


Fig. 1: Red Sea axis and deeps distribution

MABAHISS FEATURES

Mabahiss Deep and Mons

- Mabahiss Deep has a graben-like structure
- Basalt fragments (van der Zwan et al., 2015)
- Mabahiss Mons is a shield volcano with a summit caldera
- Volcanic cones inside and outside the caldera
- Graben-like structure partially affecting the Mabahiss Mons

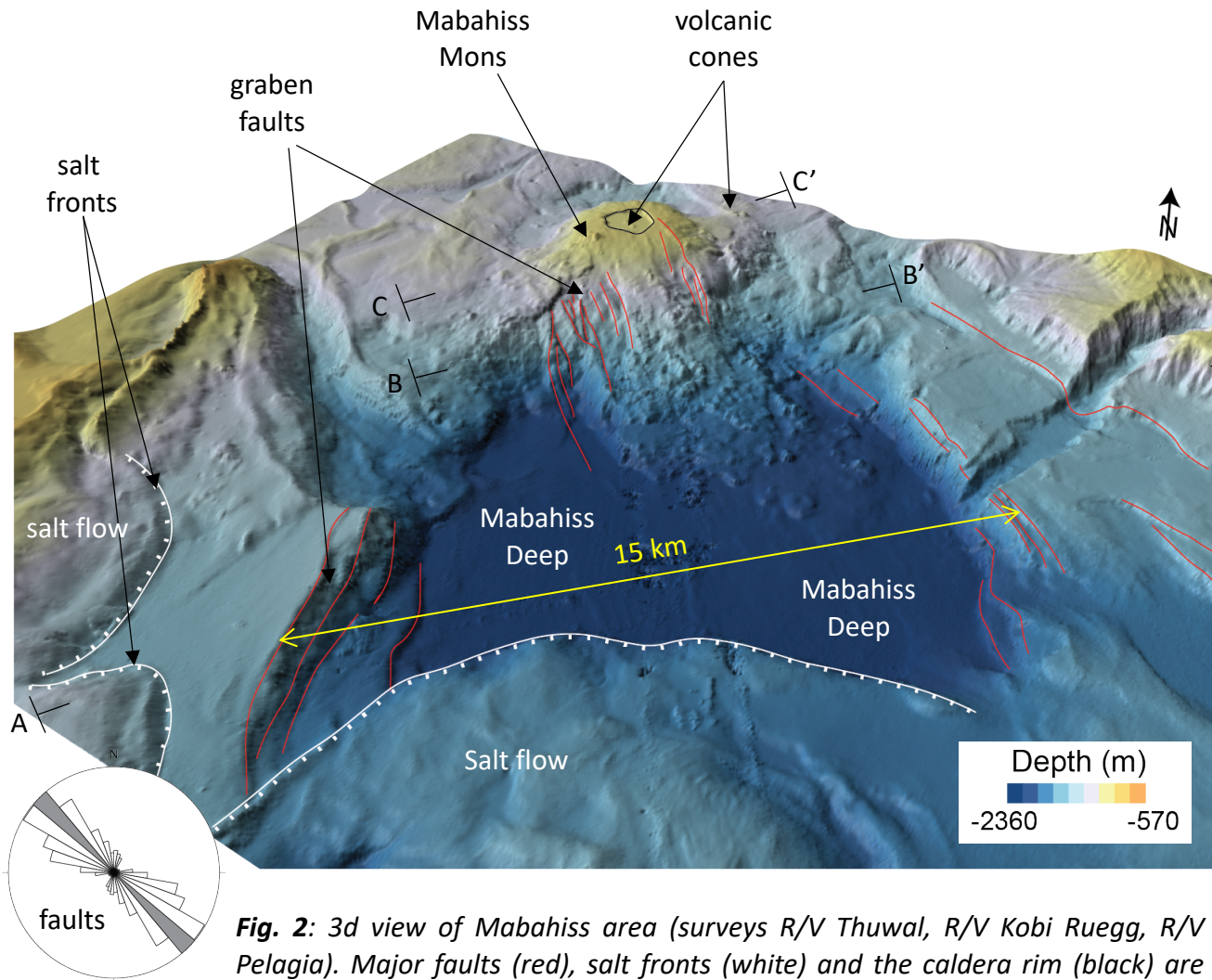


Fig. 2: 3d view of Mabahiss area (surveys R/V Thuwal, R/V Kobi Ruegg, R/V Pelagia). Major faults (red), salt fronts (white) and the caldera rim (black) are highlighted. The rose diagram indicates faults' azimuth (mean in gray).

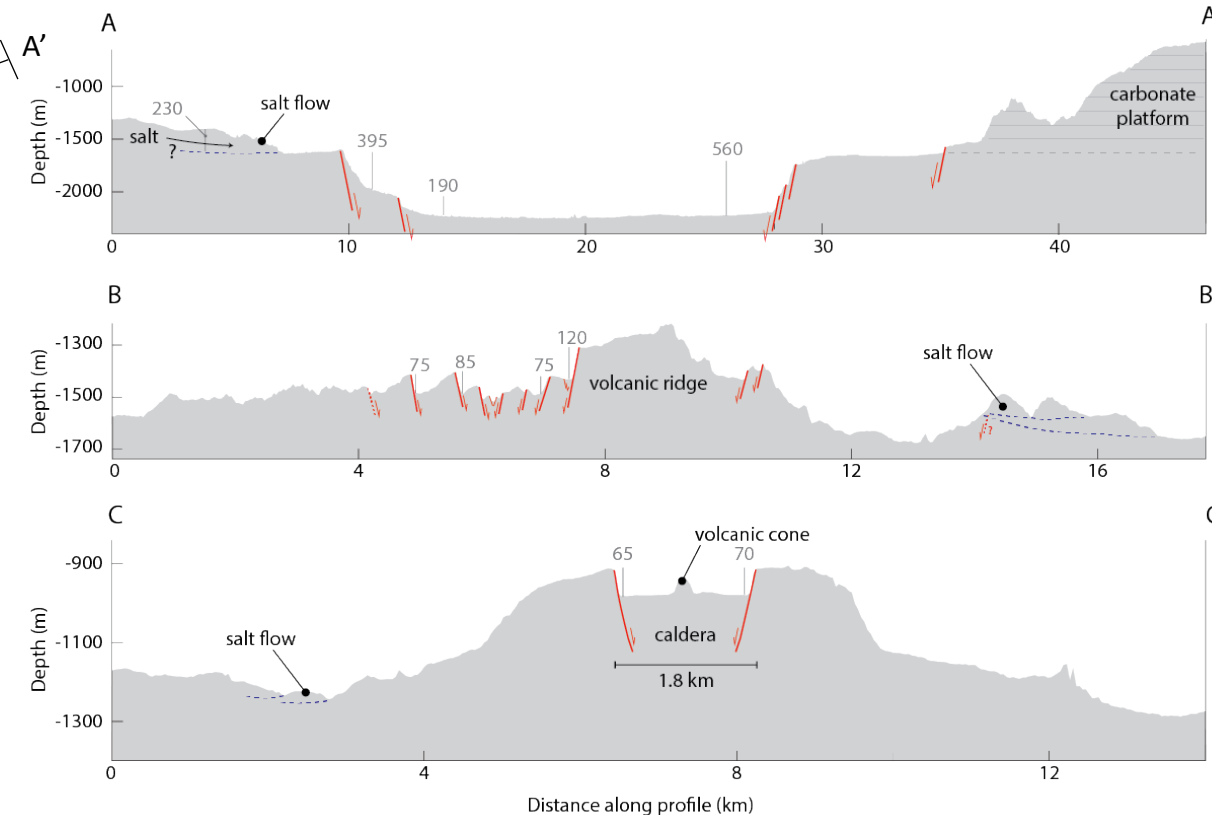


Fig. 3: schematic cross sections across Mabahiss Mons and Mabahiss Deep. Numbers on the profiles indicate the vertical displacement of major faults or the salt thickness. Unit is in meters.

SALT FLOWS

- Multiple massive salt flows (SF)
- Salt cover > 50% of the surveyed area
- Thickness up to > 500 m (salt + sediments on top)
- Flow toward the Mabahiss Deep

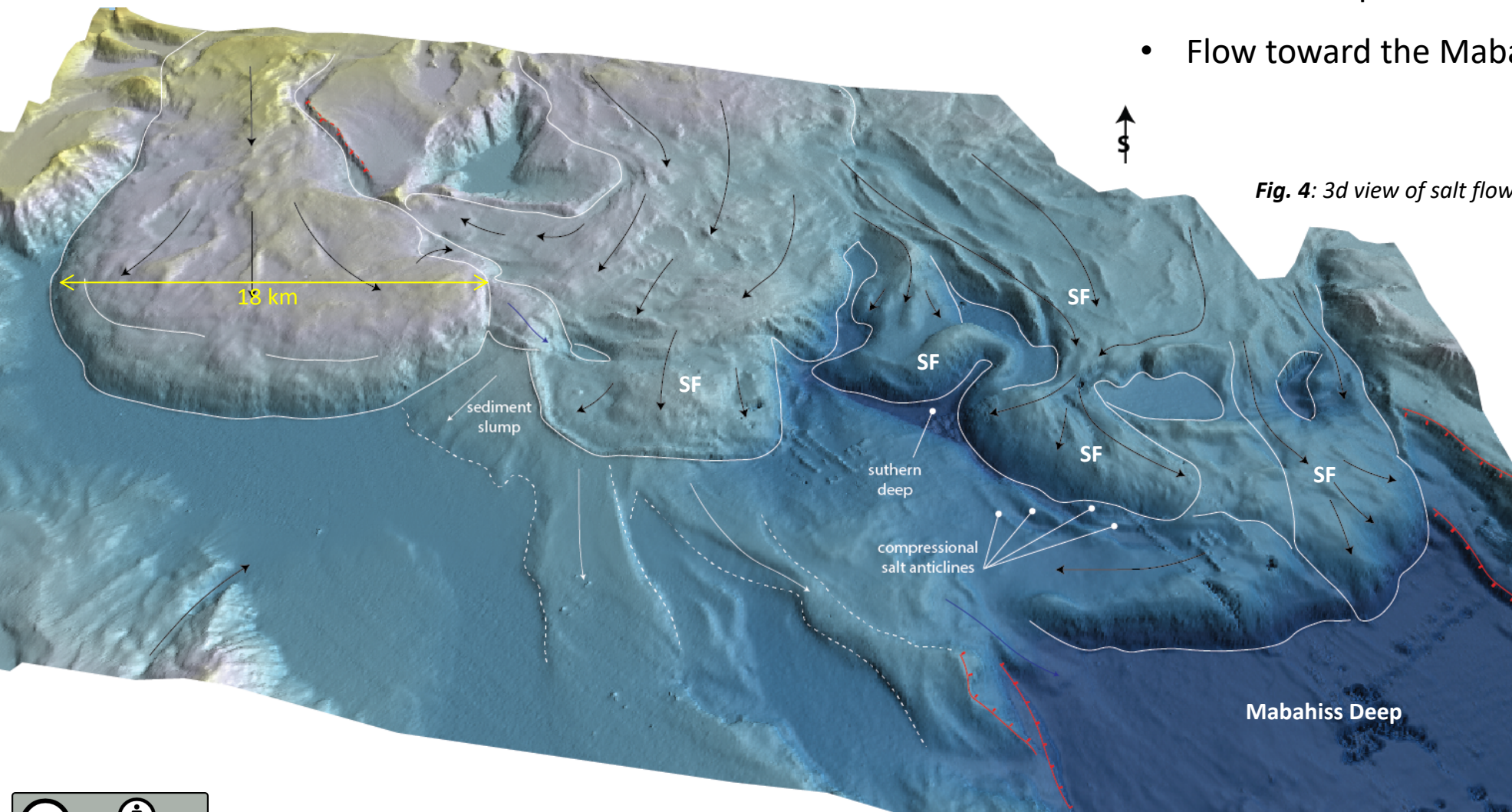


Fig. 4: 3d view of salt flows looking southward.

Mabahiss Deep

CONCLUSIONS

- Mabahiss Deep is defined by a **NW-SE graben**
 - ➔ Indicates the position of the Red Sea axis to the north of ZFZ
- Presence of **oceanic basalts** (*Altherr et al., 1988; van der Zwan et al., 2015*)
 - ➔ Mid-oceanic rifting continues north of ZFZ
- No clear **evidence** of a **transform fault**
 - ➔ the link between Mabahiss and the ZFZ remains unclear
- Seabottom largely **covered by salt** (+ sediments)
 - ➔ seafloor mostly covered by salt
- Presence of a **central volcano** (MM) with a **caldera**
 - ➔ Central and persistent magmatic source (magma chamber)
- Mabahiss Mons is not entirely dissected by rifting faults in contrast to domes in the southern Red Sea (*Augustin et al., 2016; Fig. 1*)
 - ➔ Less active rift faults, in correspondence with the lower extension rate
 - ➔ and/or younger age of the volcano

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