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High resolution seafloor acoustic imagery of the Menes mud volcano caldera complex (Nile Margin)

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Systematic acoustic mapping, using a MB Reson 7125 system operated at a frequency of 400 kHz and mounted on the Victor ROV from Ifremer, was performed during the Medeco Leg 2 expedition (HERMES program) onboard the R/V Pourquoi pas?. For the first time, the detail of the morphology of one of the major fluid/brine releasing complex, previously discovered on the foot of the northwestern Egyptian continental slope (Huguen et al., 2007), were revealed. Extending by an average of 3000 metres water depths and with an average diamater of $\sim$8 km, the Menes caldera contains four main mud volcanoes. The most active of them, Chefren and Cheops (already partly explored during previous MEDIFLUX expeditions), have been entirely mapped, intensively observed and sampled during Medeco Leg 2. Chefren mud volcano is in fact composed of two twin craters, one being presently filled by a brine lake about 200 metres in diameter, the second being empty. Gravity cores in the active one indicate high temperatures (up to 63°C) which were constant with depth for at least 150 metres (penetration limit of one of the cores). Locally, the muddy brine is overflowing from the lake, particularly along its northwestern border. Cheops mud volcano exhibits more various seafloor settings. As previously suspected its inner domain correlates with an almost flat top containing numerous muddy brine pools covered by

whitish filaments. These jacuzzi-like pools, 1 to 3 metres in diameter on average, are particularly well displayed on backscatter images and on towed OTUS photography mosaics. Cheops summit is surrounded by an almost continuous rim only interrupted by recent overflows. Evidence of more extensive past overflows are seen several hundreds of metres away from its present active top. Similarly to Chefren, temperature measurements indicate a rather constant value ($\sim$43°C) but on almost 450 metres for one of the core. Such surprising penetration indicates a very unconsolidated material supporting the presence of active convection within a mud/brine/fluid conduit. Within the Menes caldera, but off the main mud volcanoes, OTUS photography mosaics and backscatter data show the presence of surprising polygonal, few metres in size, white features which may indicate contraction processes.

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