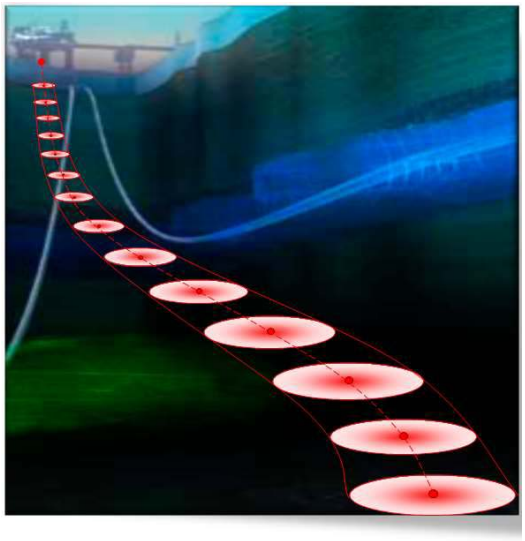
MS ELLEN CLARKE

GEOMAGNETISM SCIENTIST

BRITISH GEOLOGICAL SURVEY

EDINBURGH

NAVIGATING UNDER THE SEABED: HITTING THE TARGET WITH GEOMAGNETISM



Drilling technology over the past 2-3 decades has enabled the drilling of wells along intricate paths reaching up to 15km horizontally at depths of over 5km to targets that can be as small as 100m. Known as measurement-while drilling (MWD), down-hole survey tools (magnetometers and accelerometers) can be used to survey the well bore position as drilling progresses to ensure that the well follows a pre-planned path. MWD has proven to be as effective as using gyroscopic tools and is often the preferred operational choice. The tools must be able to achieve sufficient accuracy to ensure that the well path remains within an acceptable ellipse of uncertainty and so the various sources of error need to be well characterised. Once accuracy requirements are established, cost is then often the deciding factor in tool selection.

MWD tools rely on reference values of the full geomagnetic field vector at the location and time of each survey measurement. Ideally, the reference values would be supplied by an on-site absolute vector magnetometer. This is not usually feasible, particularly for offshore locations, and so methods are needed to estimate the values indirectly.

Equally, it is important to quantify the errors in the reference magnetic field as these contribute to well position uncertainty. The desired accuracies in the direction and strength of the geomagnetic field are around 0.1° and 50nT, respectively.

The geomagnetic field is the vector sum of magnetic fields from several sources and a reference field estimate should include the effects of each source that would create a significant error for drilling if it were ignored. Since the 1990s, the British Geological Survey (BGS), working with industry users, have developed services to meet the industry requirement. The operational aspects of the BGS services will be described showing the application requirements on global and local mathematical modelling, plus quality, continuity and real-time availability of measurements from geomagnetic observatories.

PHYSICS DEPARTMENT

COLLOQUIUM

MONDAY
24 SEPTEMBER
3.00pm
ROOM 314
SCIENCE 3

ALL INTERESTED ARE WELCOME TO ATTEND

LIGHT REFRESHMENTS TO FOLLOW IN COMMON ROOM