

#### An approach to Smart Seismic : New Ultra High Resolution Gravity and how to use it effectively.







- A History
- Gravity Why use it?
- Platforms
- The instrument options
- Resolution
- Example



# **Historically**







- **Gravity seen as a regional tool**
- **Generally limited experience within oil companies**
- **Non-uniqueness... therefore uncertainty?**

## **Present day**



- Modern acquisition techniques allow very high resolution datasets
- Certainly not just a regional tool
- Cover large areas quickly and cheaply
- Ideal for frontier exploration areas such as Africa
- The data is not the problem



## Why so Underused?



Mr. 1+2.2. 2.2  $\frac{1}{2}(\cos t)^2$ We acquired grav and mag...but haven't done much with it." (x.) 3x, +. "I don't understand how it's useful to my exploration...?" Yes). "Sounds great, but we're on an exploration timeline—no time to figure out how it really works!"

#### **Scalar Potential**



From Davies 2002



## **Acquisition - What next?**



- Existing data can only get you so far
- **If coming down in scale then higher resolution is needed**
- More acquisition?
- Which acquisition method is required?
- Which instrument is required?



#### Airborne



- Large scale areas surveyed quickly
- **Used to site 2D/3D seismic surveys**
- No ground presence



#### Airborne



- Noise associated with airborne platform.
- Flight restrictions
- Requires individual blocks of large enough size or multi-client approach
- **Solution** For marine work bathymetry data not acquired



#### Marine



- Cheap equipment placed on board seismic vessel for minimal cost
- Acquired alongside seismic data
- 4 hour recording
- Very high resolution along seismic lines
- Slower speed, reduced noise leads to better data than airborne surveys
- Bathymetry data also acquired







- Acquired along side seismic is not a pre-cursor to help seismic planning
- **Acquisition rates can be slower than airborne**
- Areal extent limited to seismic acquisition



# Land acquisition



- Highest resolution dataset
- Low-cost, unobtrusive
- **Block or site specific**
- Used for well planning, directional drilling
- Infill existing data



## Land acquisition



#### **Large scale areas impractical due to length of acquisition**



# **Typical Enquiry**



- Ground vs. FTG. vs. Falcon vs. AirGrav vs. GT2A vs. eFTG vs. Falcon plus
- Marine, land, airborne, other
- Articles can sometimes be misunderstood/misleading
- I just want to know:

Will it image my targets? Will it allow me to focus my seismic? Will it keep me within budget?

The answer given is rarely simple – but it can and should be



#### **Resolution**



A Comparison – The Face on Mars seen with the Mars Imager

When the low bandwidth data was transmitted, a face appeared to be on the surface of Mars. When the high bandwidth data reached control centre, the face disappeared and a rocky plateau was observed. The difference between the images was down to a step change in resolution. In simple terms, like taking a photo with a 4 megapixel camera vs a 40 megapixel camera. This step change equated to a factor 3; which is the same change as the eFTG to the older FTG system.



#### **Austin**bridgeporth

## **Significant Advancement**





## Salt model example





#### Salt model





## **Airborne gravity**



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#### Airborne gravity gradiometry - FTG



#### Airborne gravity gradiometry - eFTG



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#### Airborne gravity gradiometry - comparison



# Conclusions



- Recent developments have further added to the very high resolution datasets being acquired.
- Considerations should be made to both instrumentation and platform.
- Resolution requirement "horses for courses" complete feasibility study to determine.
- Smart Seismic use optimally within exploration workflow/timeline to minimise risk and maximise efficiency.



## **The End**

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