



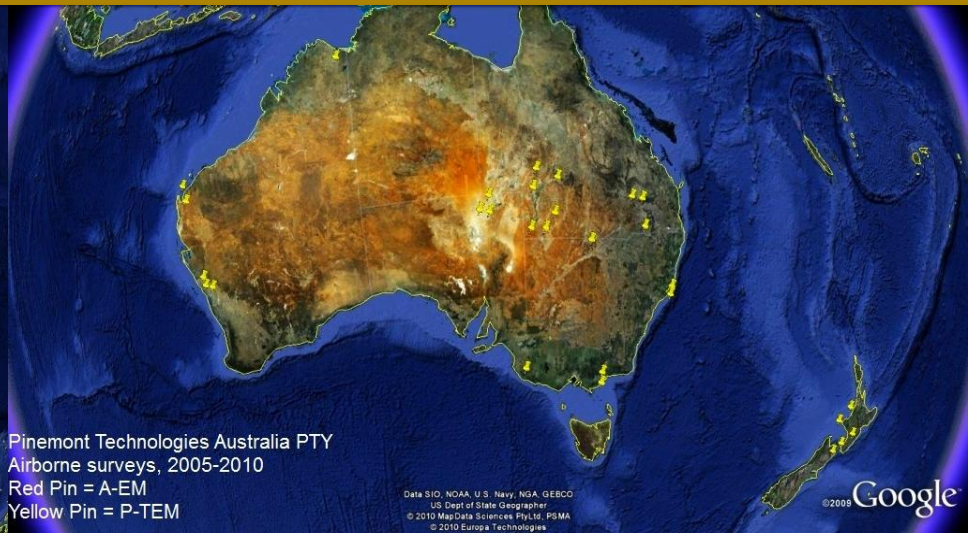
Passive Airborne Transient EM Surveys

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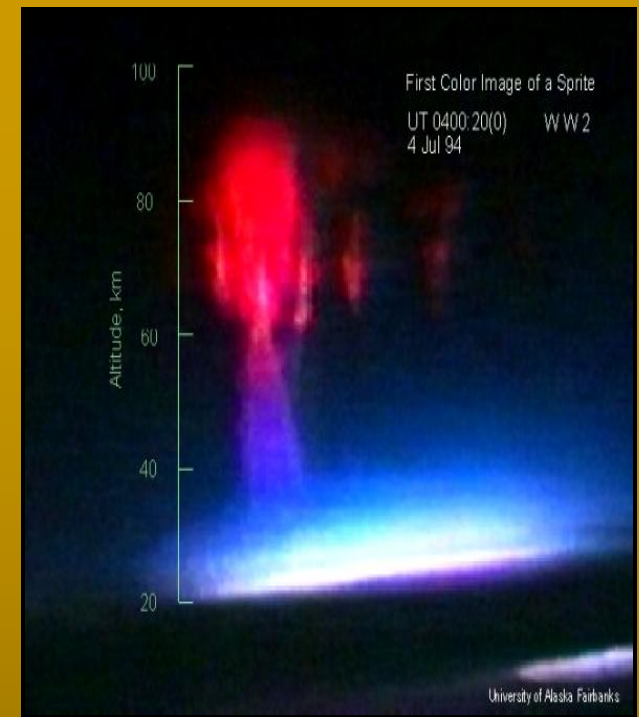
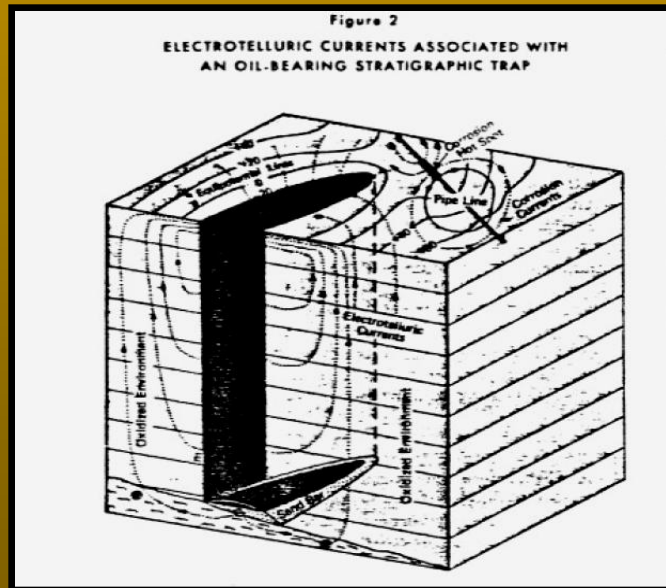
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Pinemont Technologies US and its affiliate Pinemont AU have conducted over 100 Passive Transient Pulse Surveys world wide, mainly in North America and SE Asia, Australia. Average survey area is 500 to 1000 sq/mi or 1 to 5 days– often large surveys are conducted covering over 5000sq/mi.

Pinemont has contributed to exploration projects worldwide.



Lightning activity worldwide contributes transient pulses that combined with seismoelectric streaming potentials and oscillating magnetic fields associated with Redox activity, create a measureable source of electro-magnetic (EM) transient energy radiating to the surface. Illustrated below is S.J. Pirson's Redox Cell Model where electrotelluric currents result from the hydrocarbon migration plume above the reservoir.



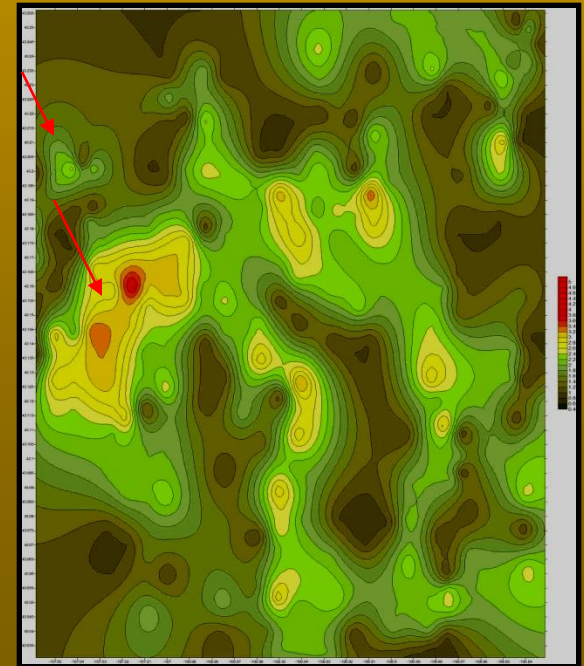
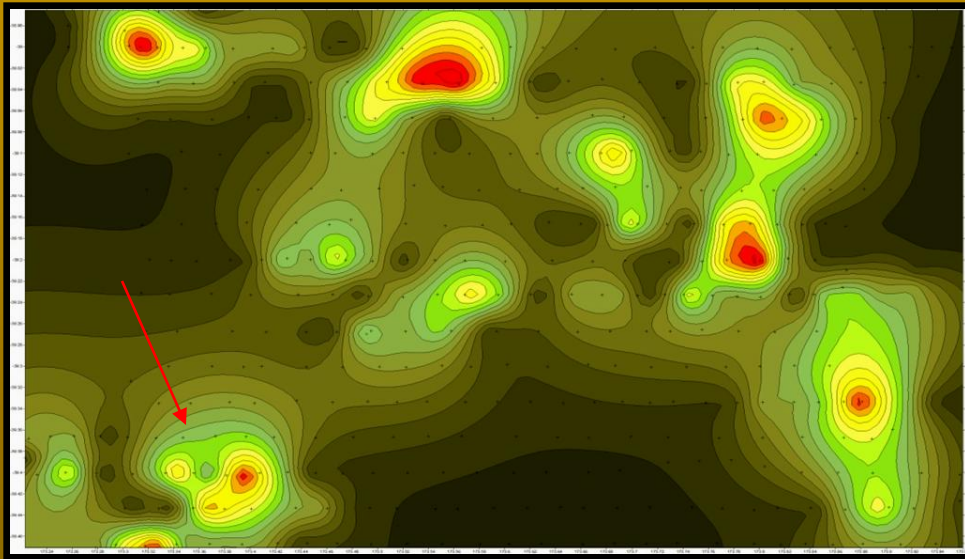
Shown above is a lightning sourced electromagnetic "sprite," as measured by the University of Alaska at Fairbanks, ascending 80+ Km into the upper atmosphere. It has been determined that between 80 – 100 lightning strikes per second on average occur worldwide.

P-TEM

Passive Transient Electromagnetic Pulse

- In 2000 - 2001 Pinemont developed the P-TEM survey as described in the 2006 AAPG paper, [Airborne Measurement of Transient Pulses Locates Hydrocarbon Reservoirs](#) By Leonard A. LeSchack, Hectori Inc, Calgary, Alberta and John R. Jackson, Pinemont Technologies Inc, Littleton, Colorado - US Patents 6,937,190 - 7,397,417 have been issued covering the P-TEM method.
- From 2001 through 2006 - over 200,000 miles of survey lines have been flown in productive areas, both on land and over the sea. Pinemont has confirmed over 40 productive wells have been drilled on positive P-TEM anomalies, with only four known non-productive holes drilled on positive anomalies.
- After 2006, when this technology was licensed to an independent operator, and P-TEM surveys were halted in the northern hemisphere, a wholly new and vastly improved Airborne Electromagnetic survey was developed in 2008. Further information regarding the P-TEM survey including a drill report can be found at Pinemont's web site <http://www.pinemontgroup.com>

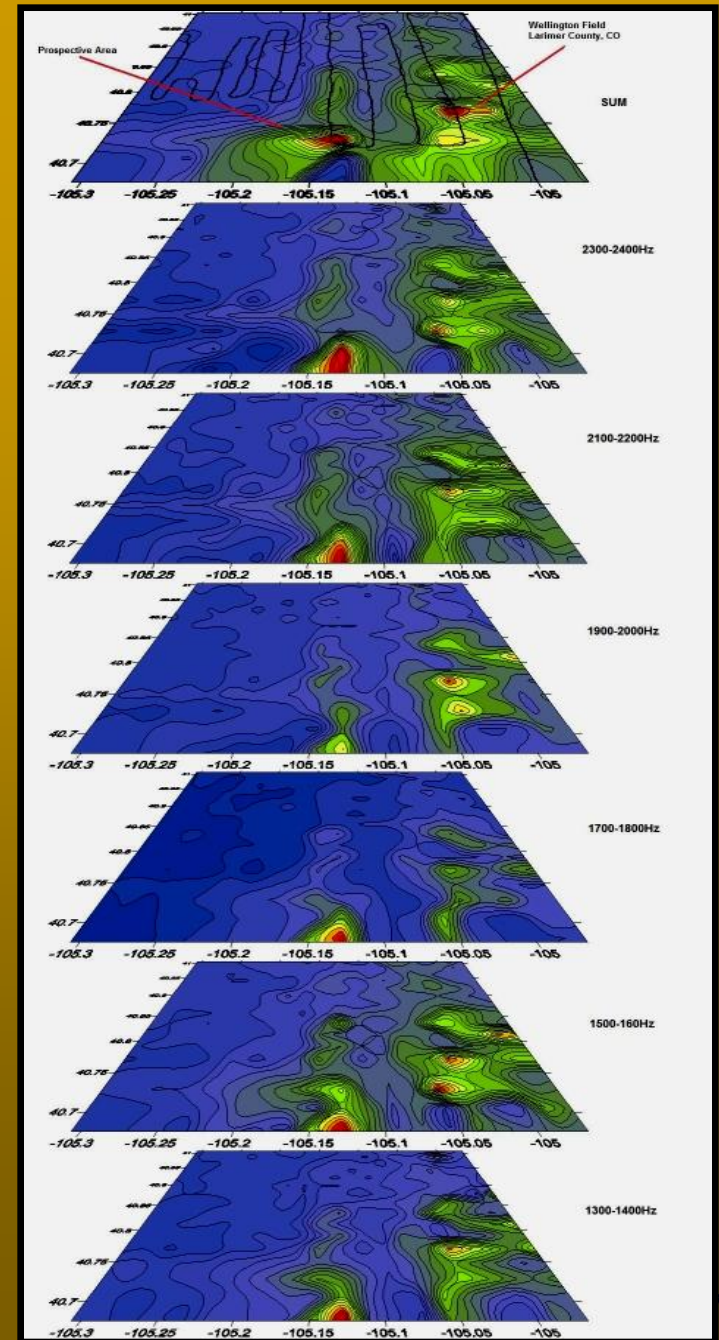
Offshore Airborne Transient Pulse Survey near New Plymouth, New Zealand (Left). Survey is 30nm by 60nm. Maui Field, the SW anomaly, has produced over 160 million barrels of oil and over 3 Tcf gas. (Right) Okie Draw Oilfield, producing from the 1000-m deep Ten Sleep Formation, Natrona County, WY USA, survey is 35nm by 20nm. Just North of the field is the old depleted Notches Dome Oilfield.



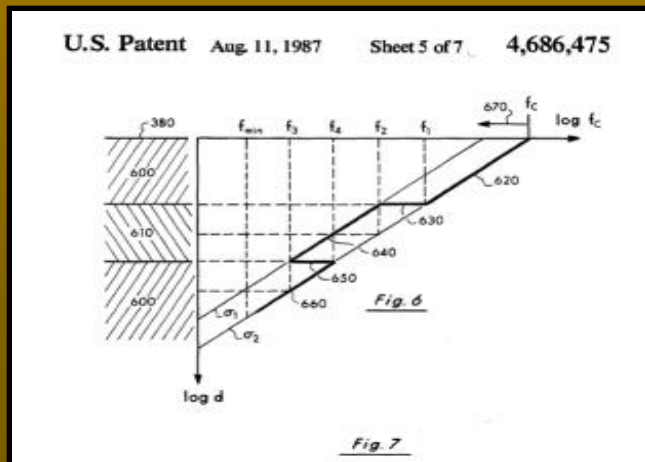
A-EM

- Airborne “**Audio Frequency Electromagnetics**” - A **new airborne method** was sought for measuring, passively, the electromagnetic emissions emanating from the earth, that would incorporate the depth information described in U.S. Patents 5,777,478 and 4,686,475.
- By combining previous research from AFMAG, electro-tellurics as described above, and drawing on recently published information on airborne EM, an operator friendly, accurate and fully digital airborne survey has been developed.
- Measurement is made by using compact, onboard equipment connected to an E-field antenna, and flying low and at a slow speed. The newly developed software enhances the transient pulses, and segments a frequency spectrum of from 200Hz - 2200Hz (audio) into 10 frequency bands (including as well, a SUM data column), then records the transient pulse amplitude data in a spreadsheet format.

Frequency-Depth slices for the recently developed A-EM Survey - flown over the Wellington Field in N Colorado, are individually mapped here. The frequency slices are stacked to best show the producing area. The production interval for this mature field is 4200-4500 ft (the bottom two frequency slices). The top slice which is the summation (SUM) of all the slices below it, also shows the trace of the airborne flight line.



Depth vs. Frequency model



Pinemont Technologies Australia Pty. Ltd: Airborne A-EM for identification of apparent resistivity using transient impulses.

Some pictures from a recent Pinemont Australia survey

Recent International Project:

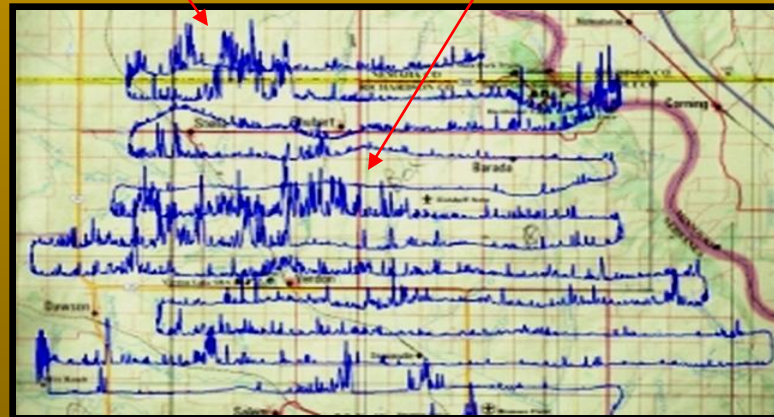
1. The images on the right show some pictures from project work undertaken in the Republic of Kyrgyzstan
2. Upon return from the field our pilot/operator works with our office staff in Perth Western Australia to communicate the details of the survey to our data processing team.
3. After data processing, the data is mapped, analysed and configured into a report for the client.



One slice of the A-EM survey, for the depth of interest, is displayed as a graph overlaid on top of the Latitude flight line. This method of displaying the data is particularly helpful for a more exacting look at the potential reservoir or tie to seismic survey.

Prospective Area

Productive Area



Conclusions

- Airborne transient-pulse technology estimates both horizontal and vertical location of subsurface hydrocarbons. With hundreds of producing fields flown over worldwide, and survey participation over the last 10 years in exploration projects worth over 2 billion dollars, we continue to be pleased with the ability of the Transient EM surveys to pinpoint hydrocarbon reservoirs in place.
- The A-EM passive survey method developed in 2008 is a breakthrough in the measurement of the earth's passive EM field's transient activity. By acquiring the data using our equipment and standard windows-based computer connected to a simple onboard E-field antenna, data acquisition can be efficiently conducted using highly portable equipment for surveying, achieving a high degree of accuracy.
- Our statistics point to a valuable and economic reconnaissance tool for the exploration industry. More than just reconnaissance, this tool, with costs as low as \$28 dollars per nautical mile, is ideal for detecting small traps in complex settings, stratigraphic porosity traps, and for confirmation of hydrocarbon content in structural plays identified by 2-D and 3-D seismic surveys.