EXPECTATIONS AND REALITY FOR DEEP GROUND PENETRATING RADAR PERFORMANCE

*Jan Francke[1]**
International Groundradar Consulting Inc, jfrancke@groundradar.com[1]

Ground penetrating radar (GPR) is unique amongst geophysical tools in its diversity of applications and imaging resolution. Since its commercialisation four decades ago, GPR has also been unique in the prevalence of some of its purveyors to oversell the method's capabilities, relying largely on the end users' lack of understanding. Early adopters in the 1980s and 90s were dismayed to find that environments suitable for its purported ubiquitous deep penetration capabilities were rare, and required resistivities well into the 1000s of Ohm m. Regardless of advances made in electronics and antennas design, the fundamental limitations have not changed.

Misconceptions, "specsmanship" and hype continue to abound in the GPR marketplace, particularly in recent years. Systems purporting to penetrate hundreds of metres using "megawatt" transmitters from the former Eastern Block have been promoted for mineral exploration, particularly in Australia and Africa. Other pseudo-radar concepts, such as the use of beam forming to achieve kilometers of penetration with centimeter accuracy, or THz laser scanners which can detect individual diamonds deep underground have generally targeted junior exploration groups who lack in-house geophysical guidance.

This work will overview the fundamentals of non-dispersive EM wave propagation in the ground, and will examine the recent published performance claims of some GPR and pseudo-GPS systems within the context of accepted EM theory. Also discussed will be accepted methods of potentially increasing GPR performance given emerging technologies, such as very low-cost systems, phased-array radars, novel transmitter and receiver designs, and new GPR antennas.