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电离层-均匀地球模型中地表水平电偶极子激发的电磁场

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Electromagnetic fields excited by the horizontal electrical dipole on the surface of the iono

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摘要

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摘要 本文在电离层-均匀地球模型中使用Debye势方法,在电磁场一般性边界条件下导出了地表水平电偶极子源在地球介质磁场的表达式.对球Bessel函数使用指数函数近似,并采用加速算法,计算了地表及地下的电磁场.其正确性得到理论计算和实的多方面支持.结果表明,在收发距离大于1000 km,电磁场强度很稳定,几乎没有衰减的迹象;电磁场受电离层的影响很大,由度升高或电导率减小引起的电磁场幅度的减少可以达到50%,但是由电场和磁场得到的视电阻率变化却很小.

关键词: 超低频/极低频电磁波 水平电偶极子 地球-电离层系统

Abstract: In this paper, we get the formulas for the electromagnetic field excited by the horizontal electrical dipole on the surface of the earth in the system of ionosphere-homogeneous earth model by Debye potential method. Sphere Bessel functions are approximated by exponential functions and accelerating algorithm for their convergence in our computations. It is proven to be correct through different aspects of theoretical calculations and field observations. Our results show the electromagnetic intensity is very stable even though the distance of transmitter-receiver is larger than 1000km; the ionosphere's influence on electromagnetic field is strong, the electromagnetic intensity may decrease by 50% due to the increase of the ionosphere's height. The decrease of the ionosphere's conductivity, however, the apparent resistivity is very stable.

Keywords: SLF/ELF electromagnetic wave Horizontal electrical dipole Earth-ionosphere system

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