Report - 1D Modeling Program

In this report we show the processing of synthetic MT data through the 1D Modeling Program.

Importing useful python modules

In [1]:
```
import os
import numpy as np
import sys
import matplotlib.pyplot as plt
import ConfigParser
%matplotlib inline
```

Changing the current working directory

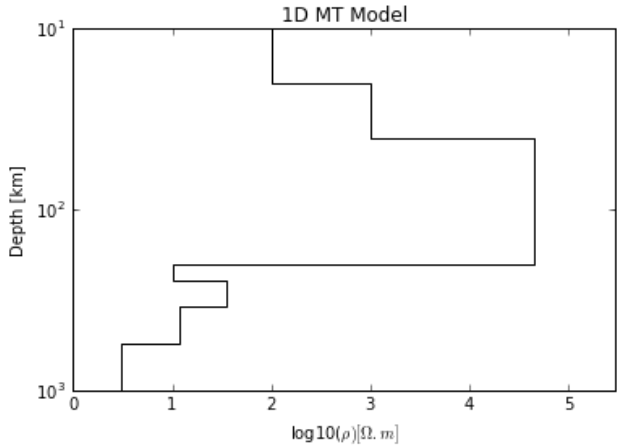
In [2]:
```
os.chdir('C:/Users/HATABILIDADE/Documents/MT1D/')
```

1D Modeling Program

In [23]:
```
# Initialize variables
# Magnetic permeability
mu = 4e0 * np.pi * 1e-7

# Define some classes
class Model(object):
    def __init__(self):
        self.nlay = None
        self.rho = None
        self.thick = None



class MT(object):
    def __init__(self):
        self.name = ""
        self.nper = None
        self.p = np.zeros(0)
        self.z = np.zeros(0)
        self.tip = np.zeros(0)
        self.rho = np.zeros(0)
        self.pha = np.zeros(0)



class PlotMT():
        #class Depth:
        class Depth(object):
            def __init__(self, Units='m', Scale='linear', Minimum=0.1
, Maximum=5000):
                if (Units is 'm'): PlotMT.self.Units = 'm'
                if (Scale is 'linear'): PlotMT.self.Scale = 'linear'
                if (Minimum is 0.1): PlotMT.self.Minimum = 0.1
                if (Maximum is 5000): PlotMT.self.Maximum = 5000

        #class Rho:
        class Rho(object):
            def __init__(self, Minimum=0.1, Maximum=10000):
                if (Minimum is 0.1): self.Minimum = PlotMT.Minimum
                if (Maximum is 10000): self.Maximum = PlotMT.Maximum



def pause ():
    try:
        input("Press enter to continue")
    except SyntaxError:
        pass



def CheckConfigSections(config):
    t1 = config.has_section('MODEL')
    t2 = config.has_section('PERIODS')
    if not (t1 and t2):
        sys.exit("ERROR: config file not correct. Either the MODEL or
 FREQUENCY sections are missing.")
#    t3 = config.has_section('PLOT')



def getparameters():
# Get parameters from Configuration file: Model.ini
    # initialize config
```

1D Model

In [24]:
```
xModel = Model()
xMT = MT()
xModel, xMT, xPlot = getparameters()
printmodel(xModel, xPlot)
```

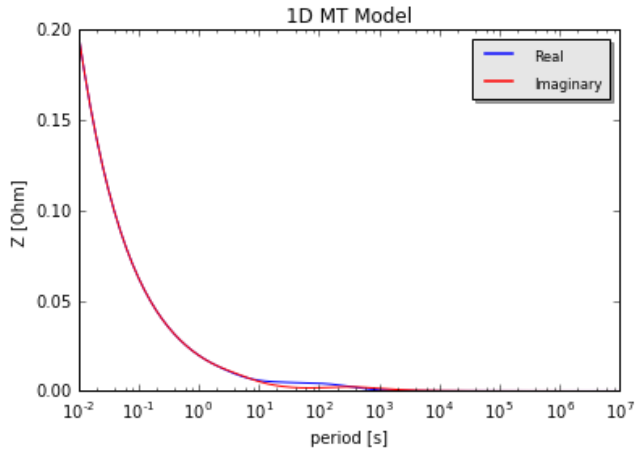


This model has parameters according to a layered Earth without lateral heterogeneity. This section is based in a gradual increase of resistivity in the Crust and Mantle until ~150 km of depth. In ~200 km of depht, we have a discontinuity that is related with the Lithosphere-Asthenosphere boundary (LAB). And later, we have a Conducting mantle.

We made this model because we are testing if the MT method can recovery the structure bellow a high-resistance layer, like our model.

Impedances for 1D Model

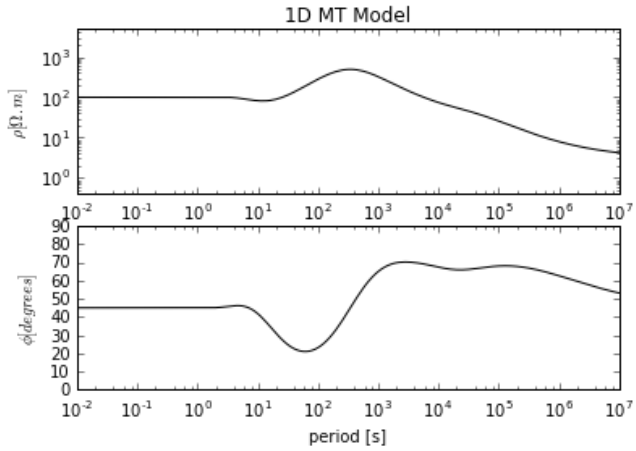
In [25]:
```
mtcurve( xModel, xMT )
plotz( xMT )
```



This graph shows the variation of the Impedance in fuction of the period. There is a important feature between the periods 10^1 ***and*** 10^2***.***

Apparent resisitivties and Phases for 1D Model

In [26]:
```
getrhopha( xMT )
plotrhopha( xMT )
```



This last graph shows the convertion of the impedances in apparent resisitivties and phases. We can observe between the periods 10^1 ***e*** 10^3 ***a bulge in the aparent resistivity and a large depression in the phase. The segment is related with the high-resistance layer in our model. In the apparent resistivity we can see the gradual increase of the resitivity, later a high-resistivity value between the periods*** 10^1 ***e*** 10^3***. After that we can observe a conductive behaviour in the high periods.***

The LAB is hidden below the high-resistance layer, and its signal is masked by the high-amplitude signal. Thus, it is hard to recover structures below high-resistance layers.