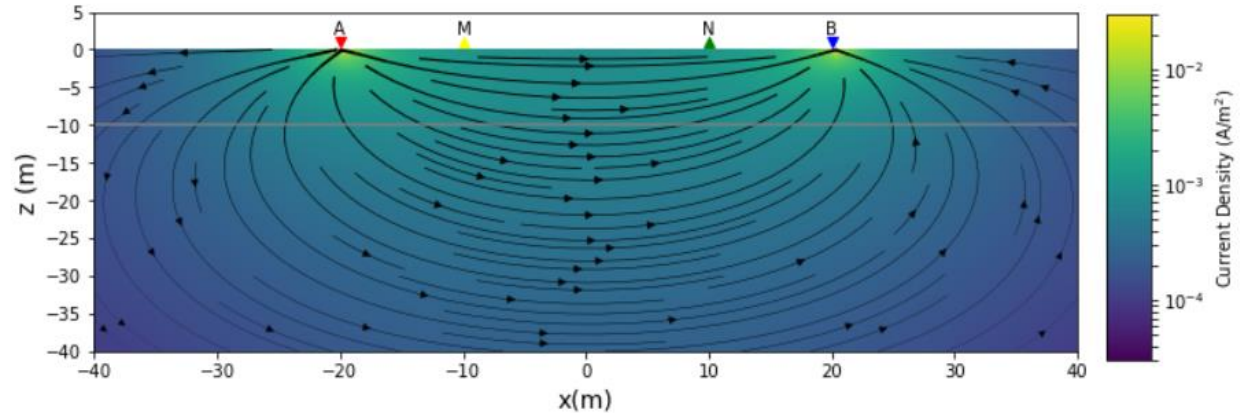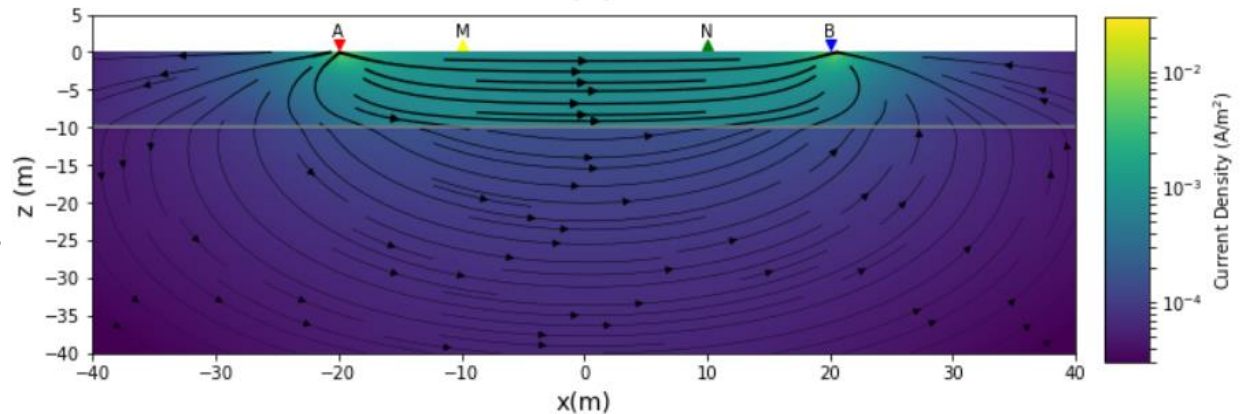# Current in 2 Layer Earth

Half-space
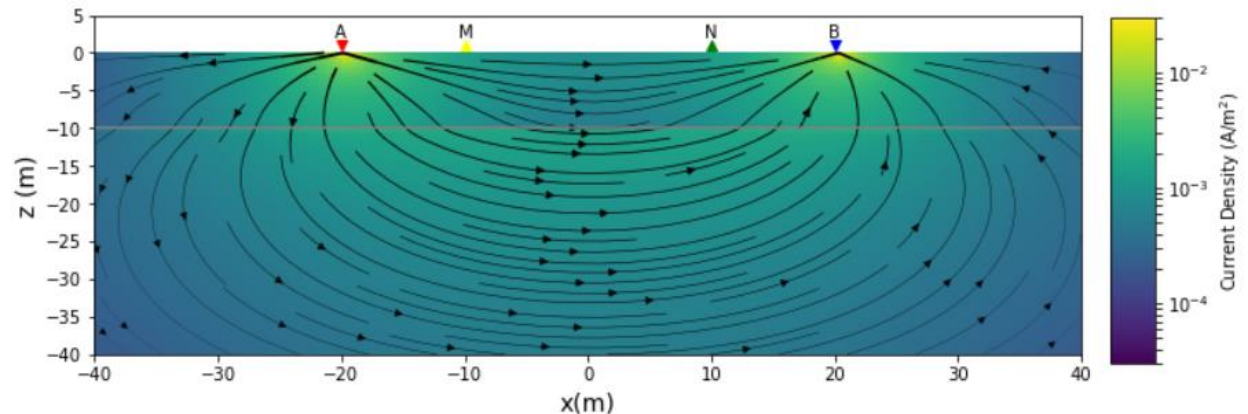
- Current path depends on distance between electrodes

Less resistive top layer (ρ1 < ρ2)

- Top layer is shortest and easiest path for current to travel
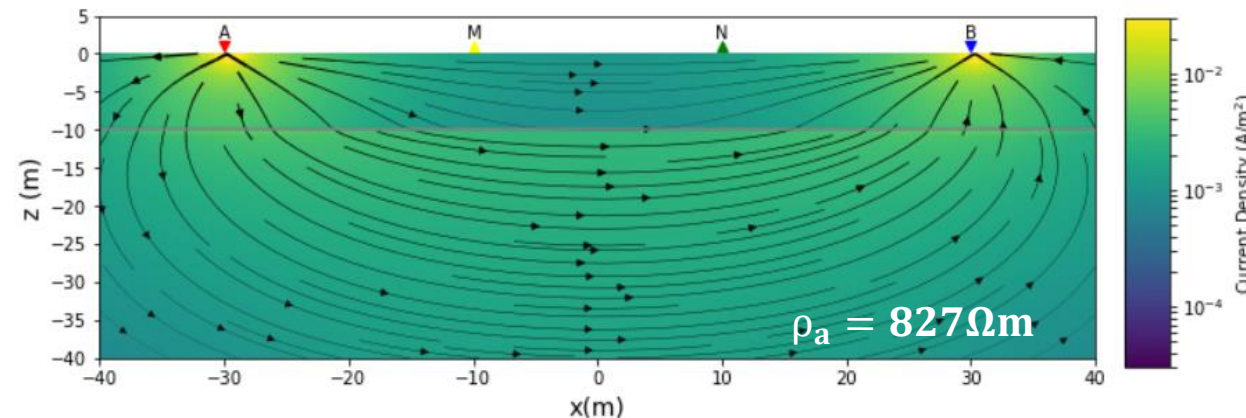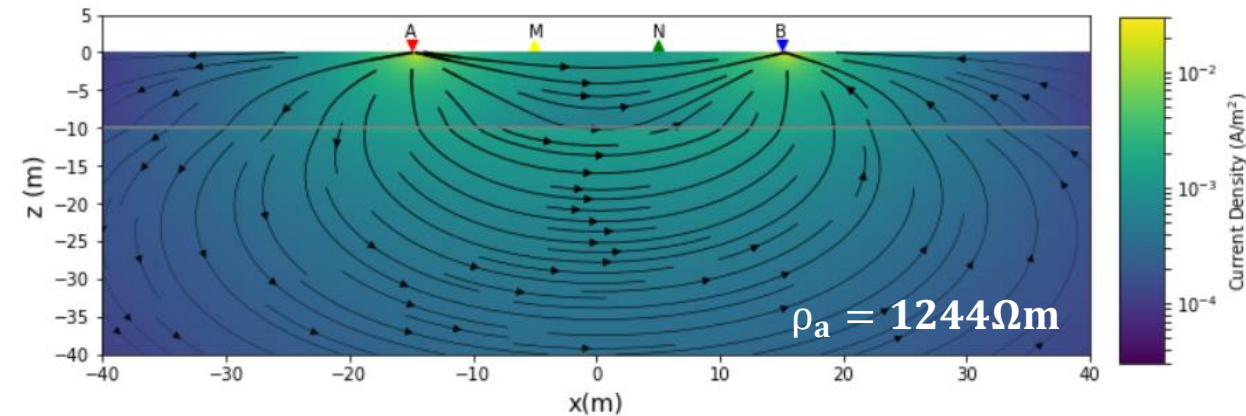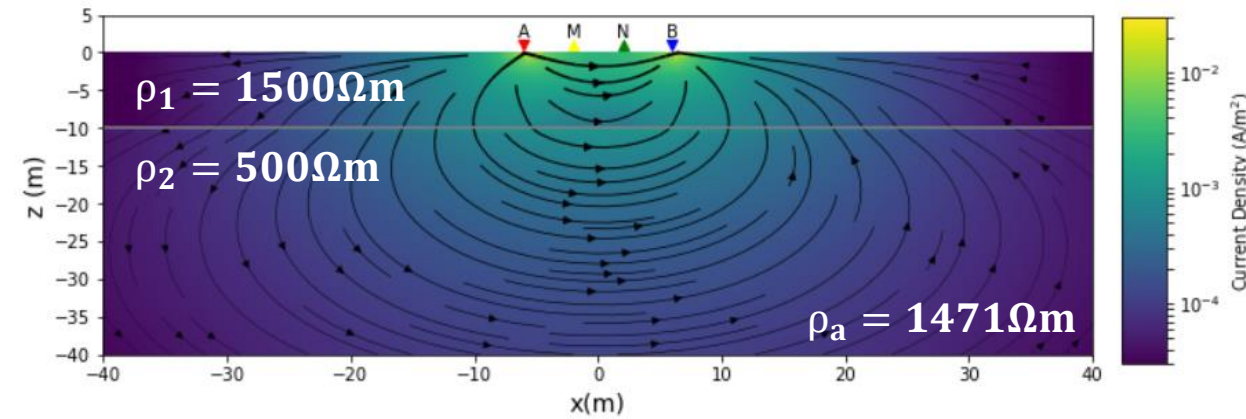- Most current travels through top layer

More resistive top layer (ρ1 > ρ2)

- Current cannot travel as easy in top layer
- Much of the current will try to travel more in the bottom layer
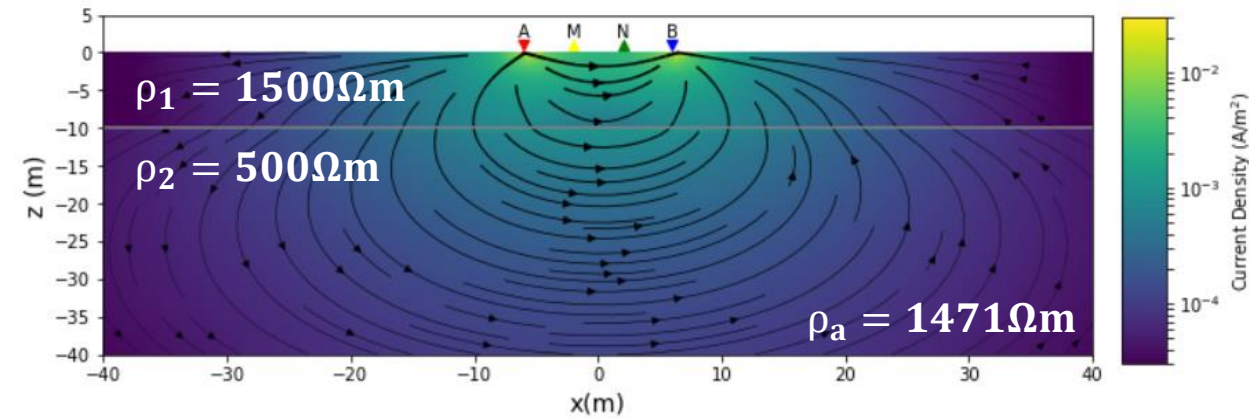
Apparent Resistivity

$\rho_1 = 1500\Omega m$

$\rho_2 = 500\Omega m$

$\rho_a = 1471\Omega m$

$\rho_a = 1244\Omega m$

$\rho_a = 827\Omega m$

Definition: The resistivity of the "half-space" that would give you the same voltage you just measured.

Basic concept:
It is a "weighted average" of the Earth's resistivity, <u>in the region where most of the currents are going</u>.

The apparent resistivity tells you the general resistivity of the Earth, in the region your measurement is "seeing"

Sounding Measurements: 2 Layer Earth

$\rho_1 = 1500\Omega m$

$\rho_2 = 500\Omega m$

$\rho_a = 1471\Omega m$

$\rho_a = 1244\Omega m$

$\rho_a = 827\Omega m$

Electrodes very close

- Most currents stays very close to surface and do not go into lower layer
- Lower layer does not impact apparent resistivity
- Apparent resistivity close to top layer resistivity
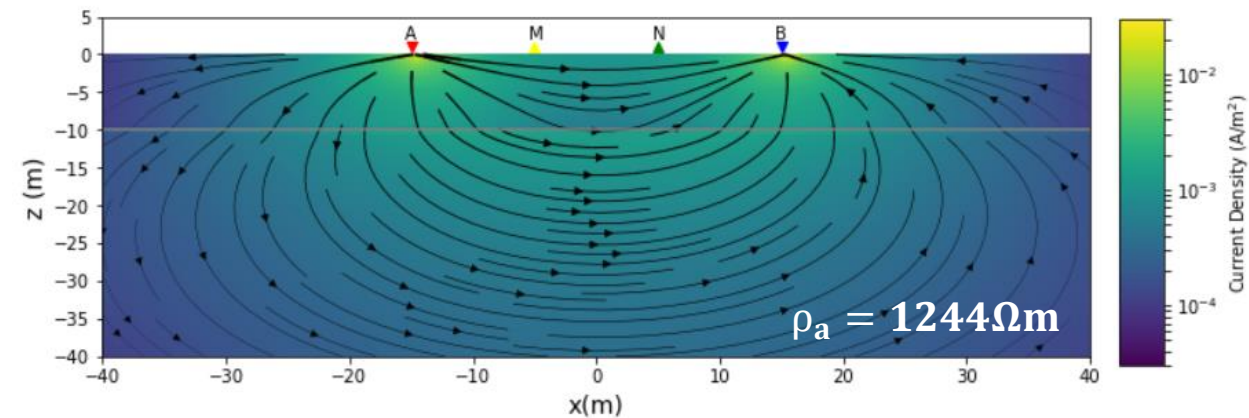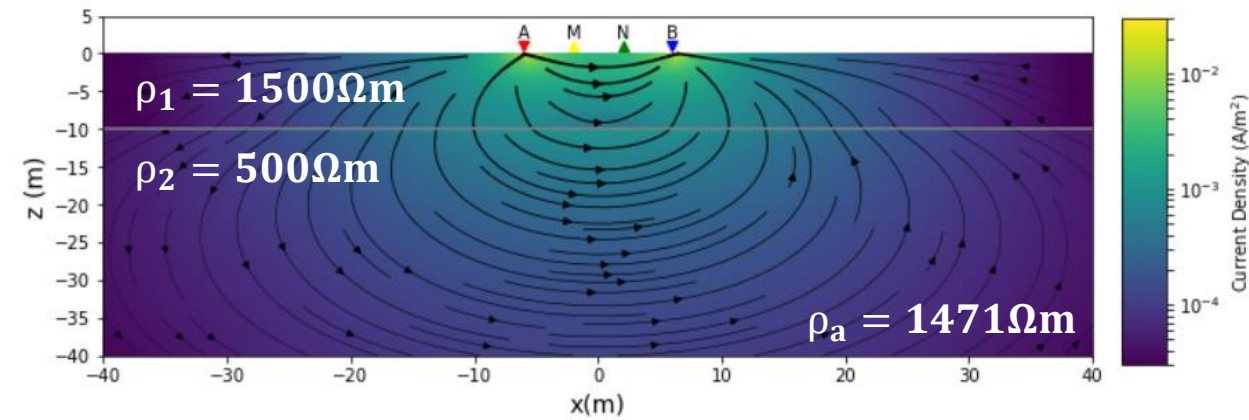
Electrodes more spaced

- Some currents in lower layer
- Lower layer impacts apparent resistivity value
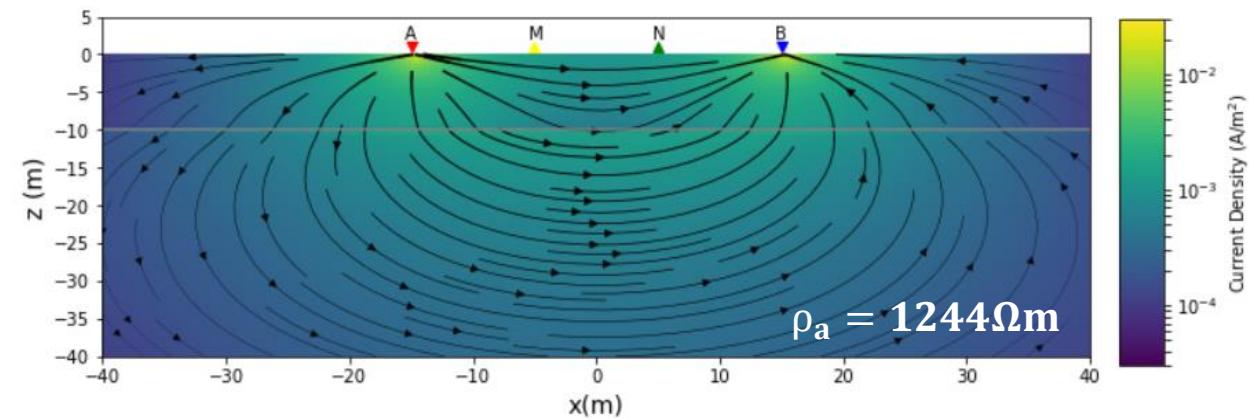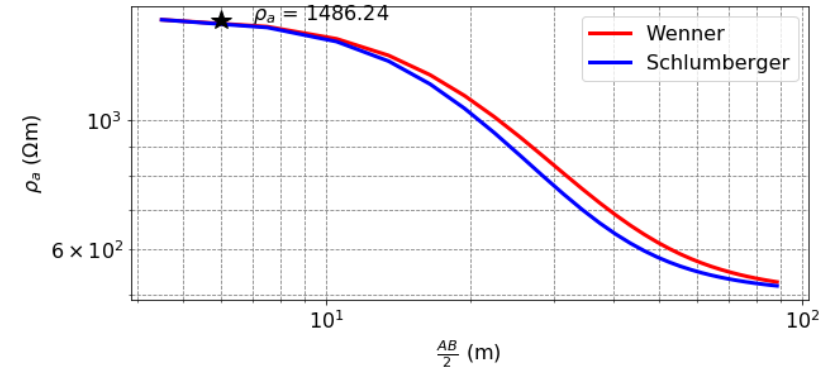- Apparent resistivity value lower than previous one
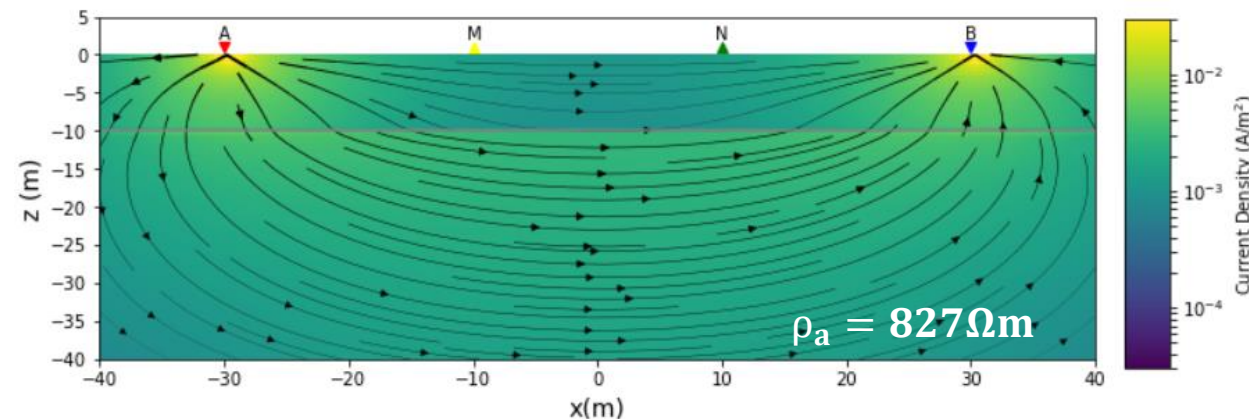
Large electrode spacing

- Much more current in lower layer because it is conductive AND spacing is large
- Lower layer has big impact on apparent resistivity
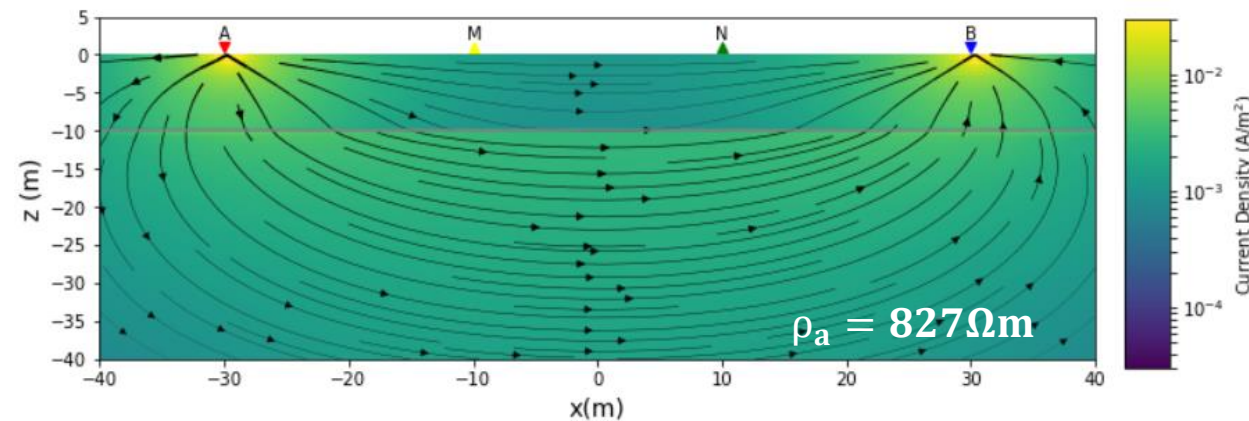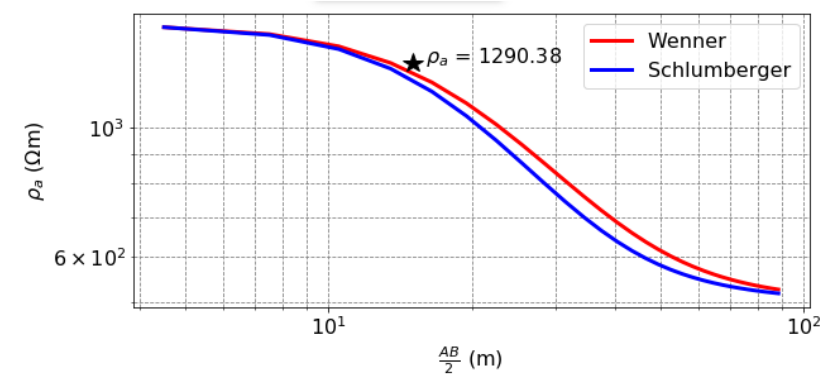- Apparent resistivity is closer to bottom layer value

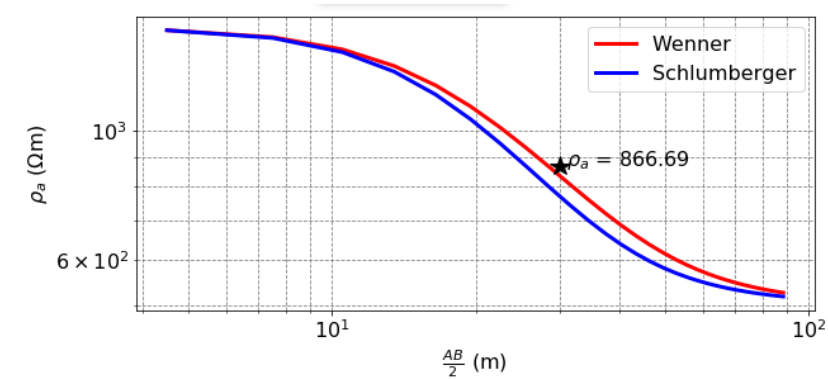# Sounding Measurements: 2 Layer Earth

Geophysical Inversion Concept

What inversion does:

Starting with geophysical data, inversion tries to find a resistivity model that:

1) Reproduces the field data well

2) Is similar enough to the true geology

What inversion does NOT do:

- It does <u>not</u> find the true resistivity of the Earth.

- It does <u>not</u> try to fit the data values perfectly, because we assume the data have noise/errors