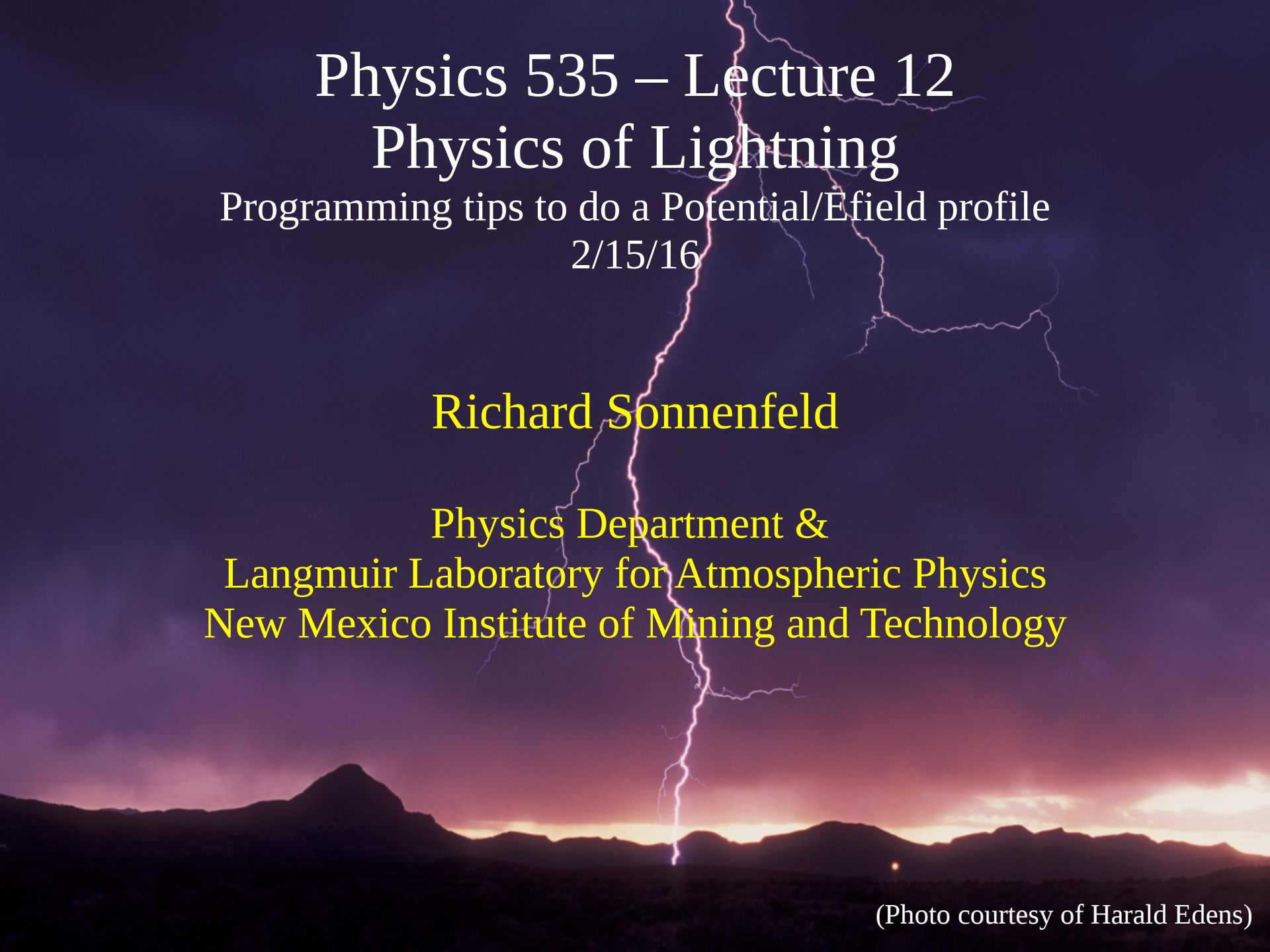
Physics 535 – Lecture 12
Physics of Lightning

Programming tips to do a Potential/Efield profile

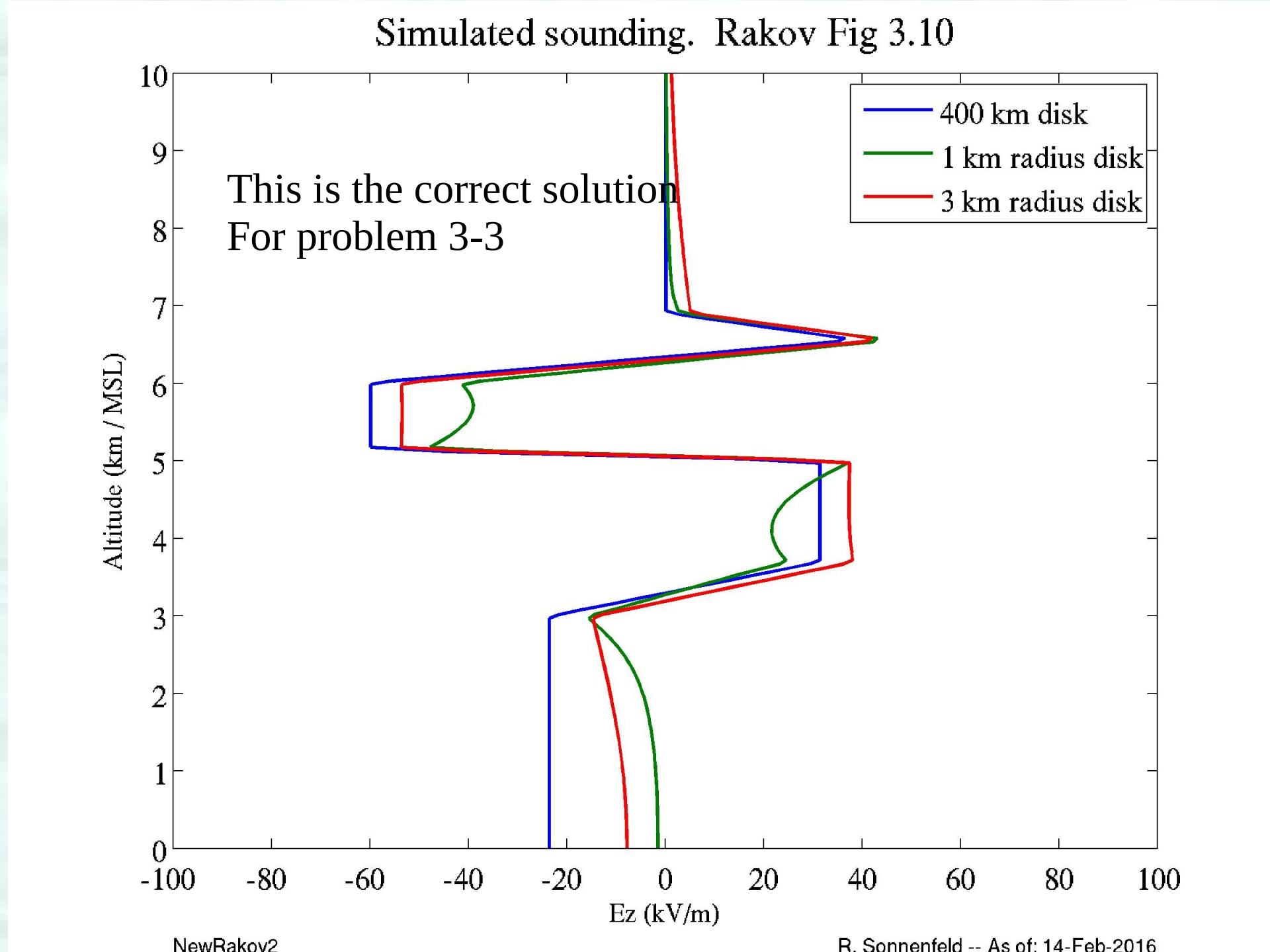
2/15/16

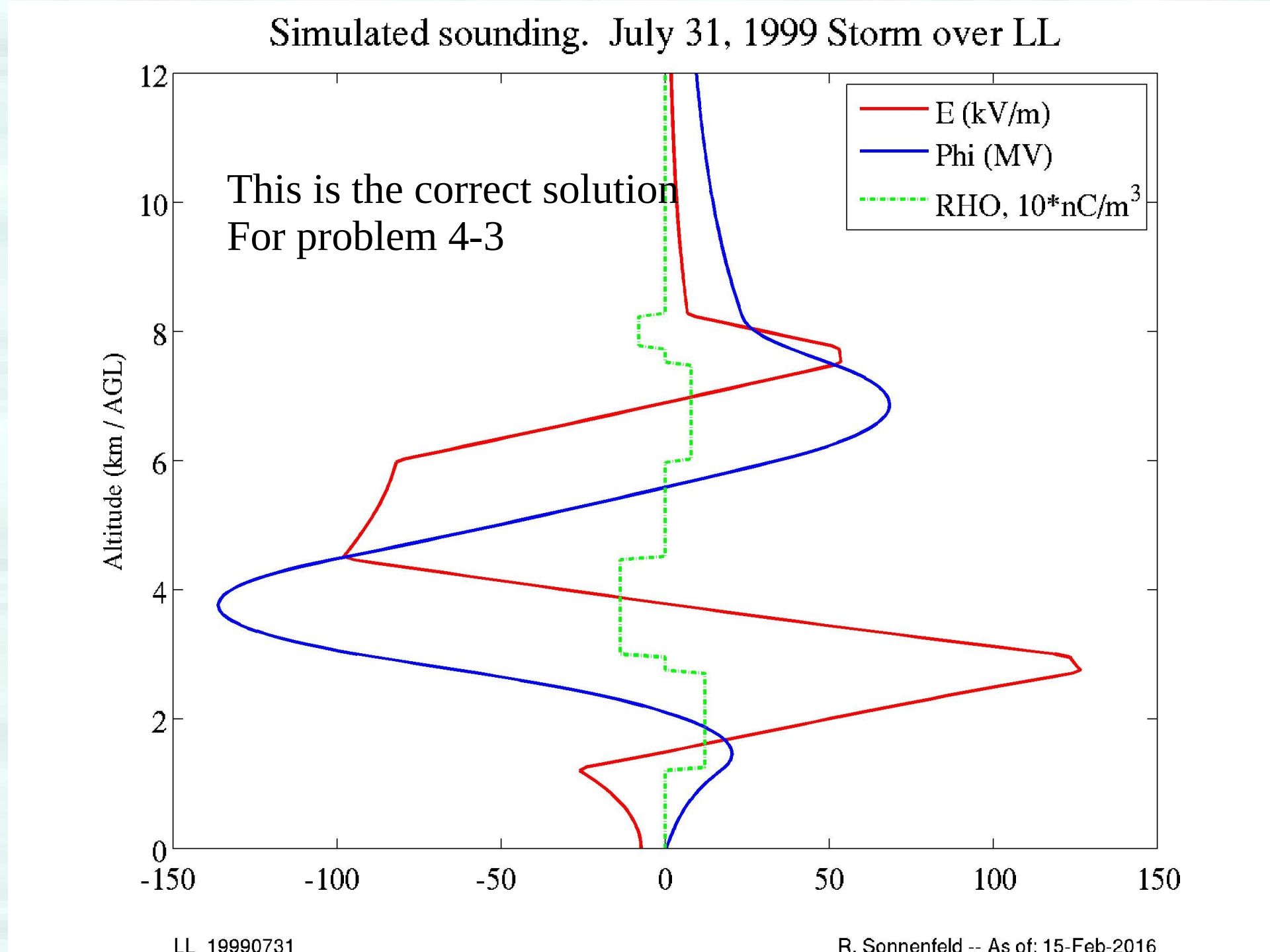
Richard Sonnenfeld

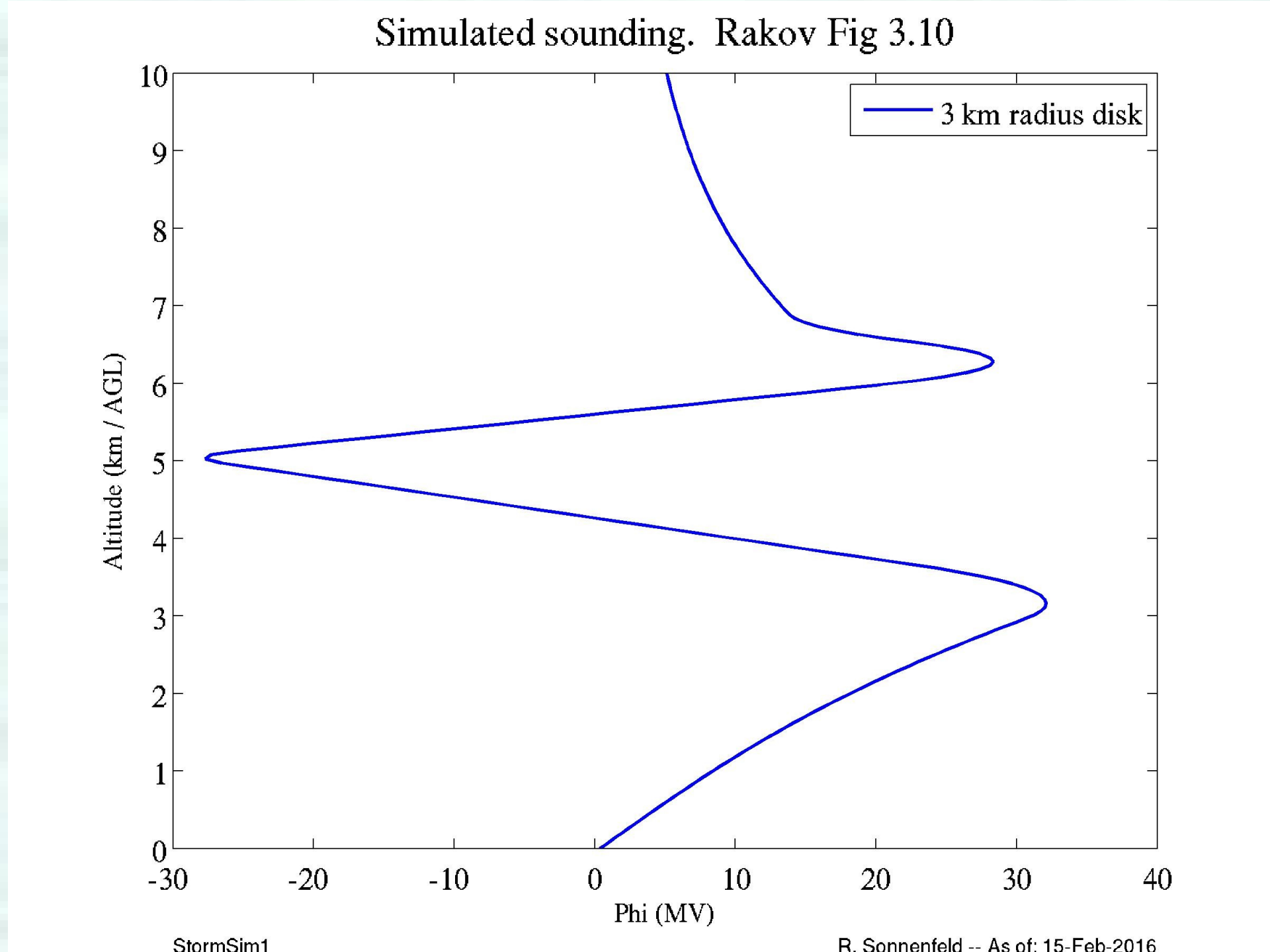
Physics Department &
Langmuir Laboratory for Atmospheric Physics
New Mexico Institute of Mining and Technology

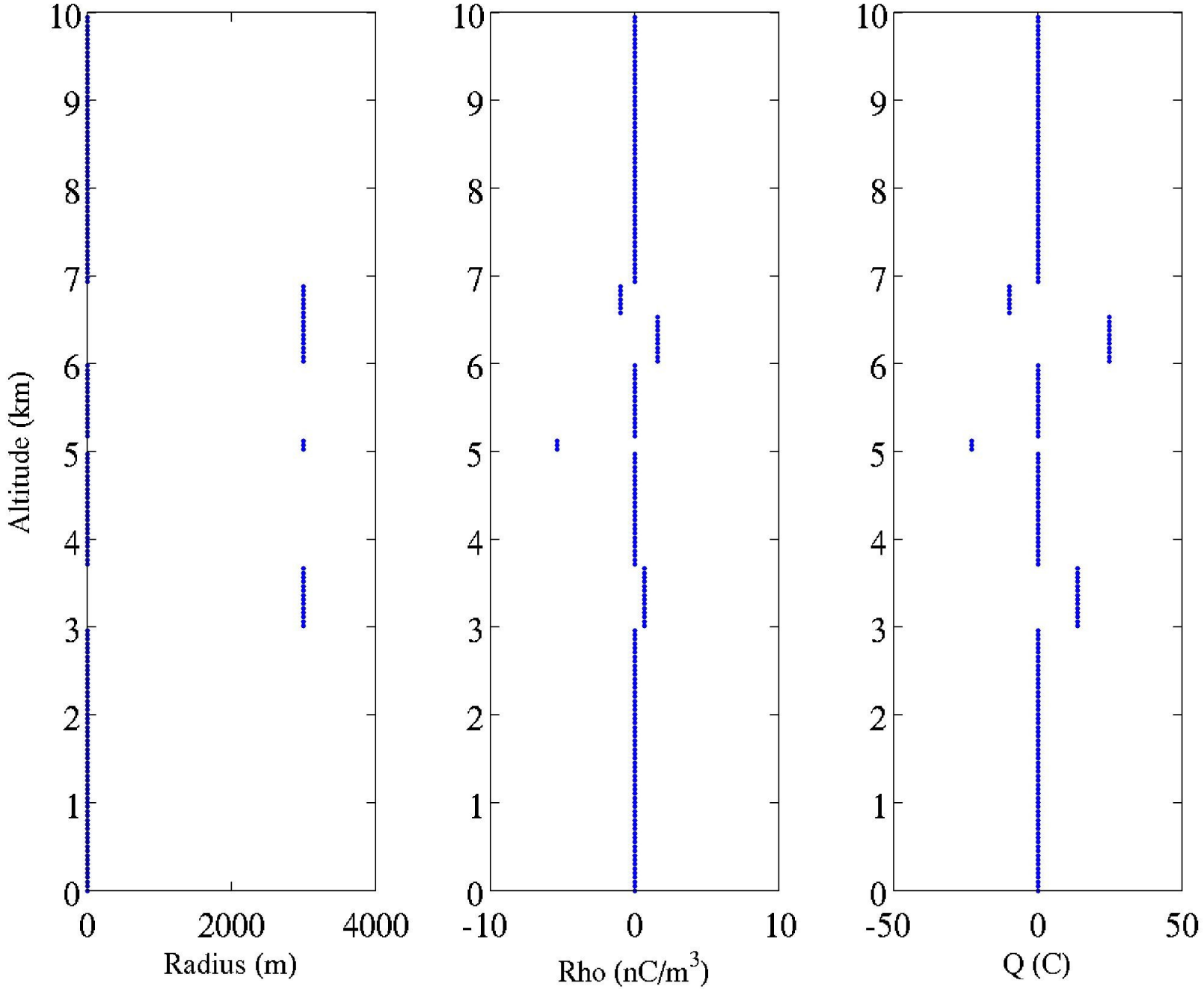


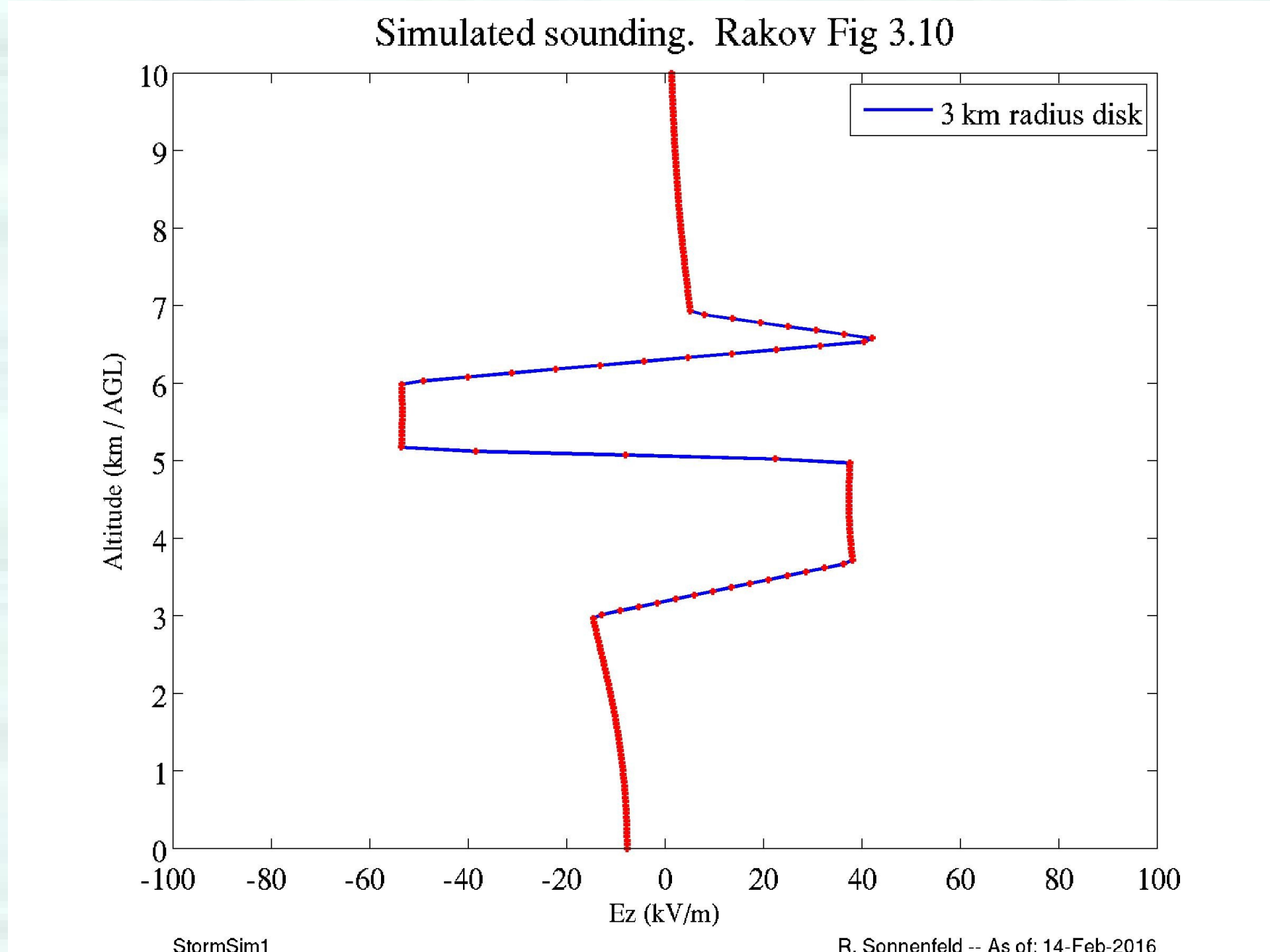
(Photo courtesy of Harald Edens)

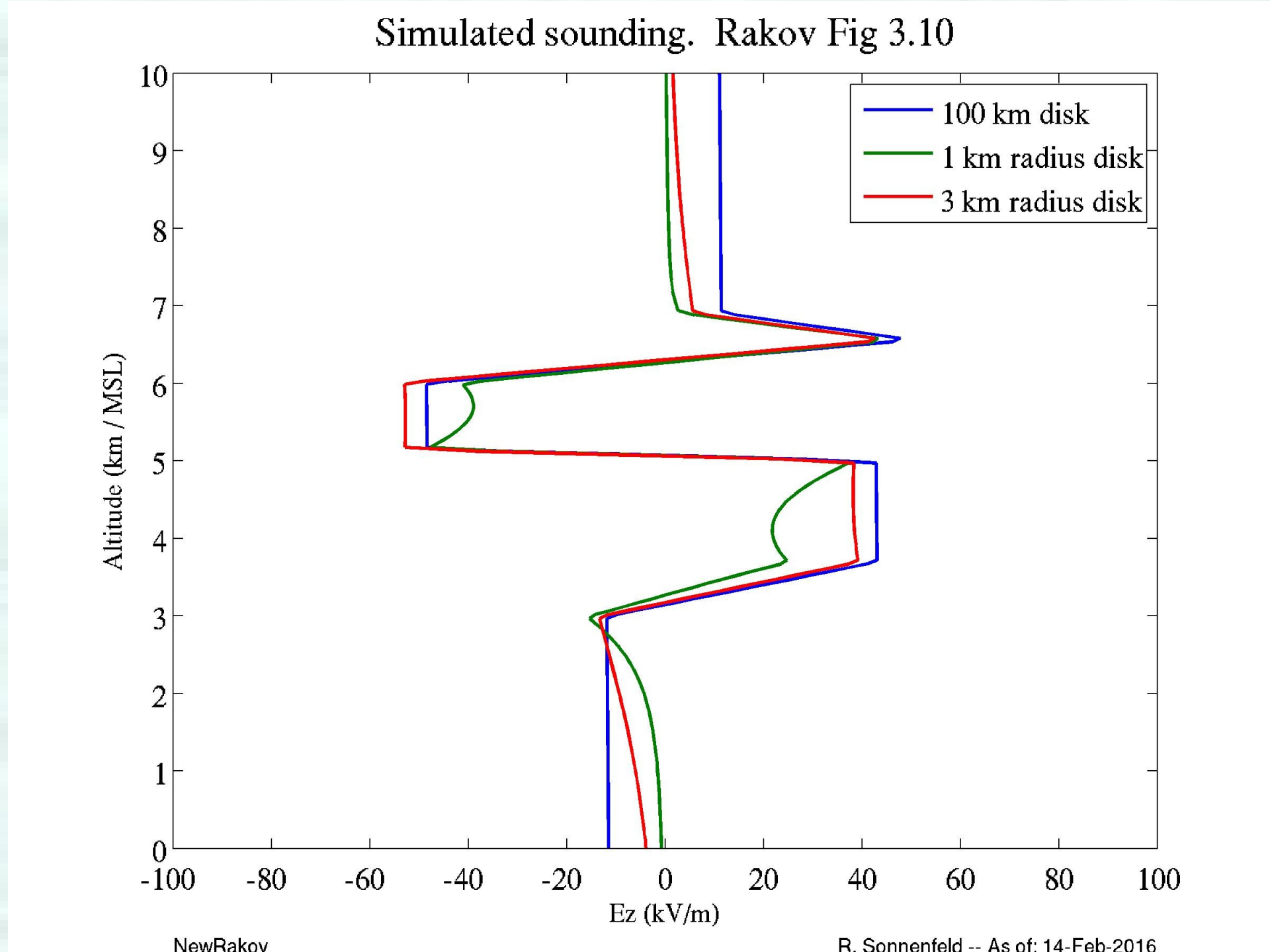

Simulated sounding. Rakov Fig 3.10
This is the correct solution
For problem 3-3
400 km disk
1 km radius disk
3 km radius disk
Altitude (km / MSL)
Ez (kV/m)
10
9
8
7
6
5
4
3
2
1
0
-100
-80
-60
-40
-20
0
20
40
60
80
100
NewRakov2
R. Sonnenfeld -- As of: 14-Feb-2016

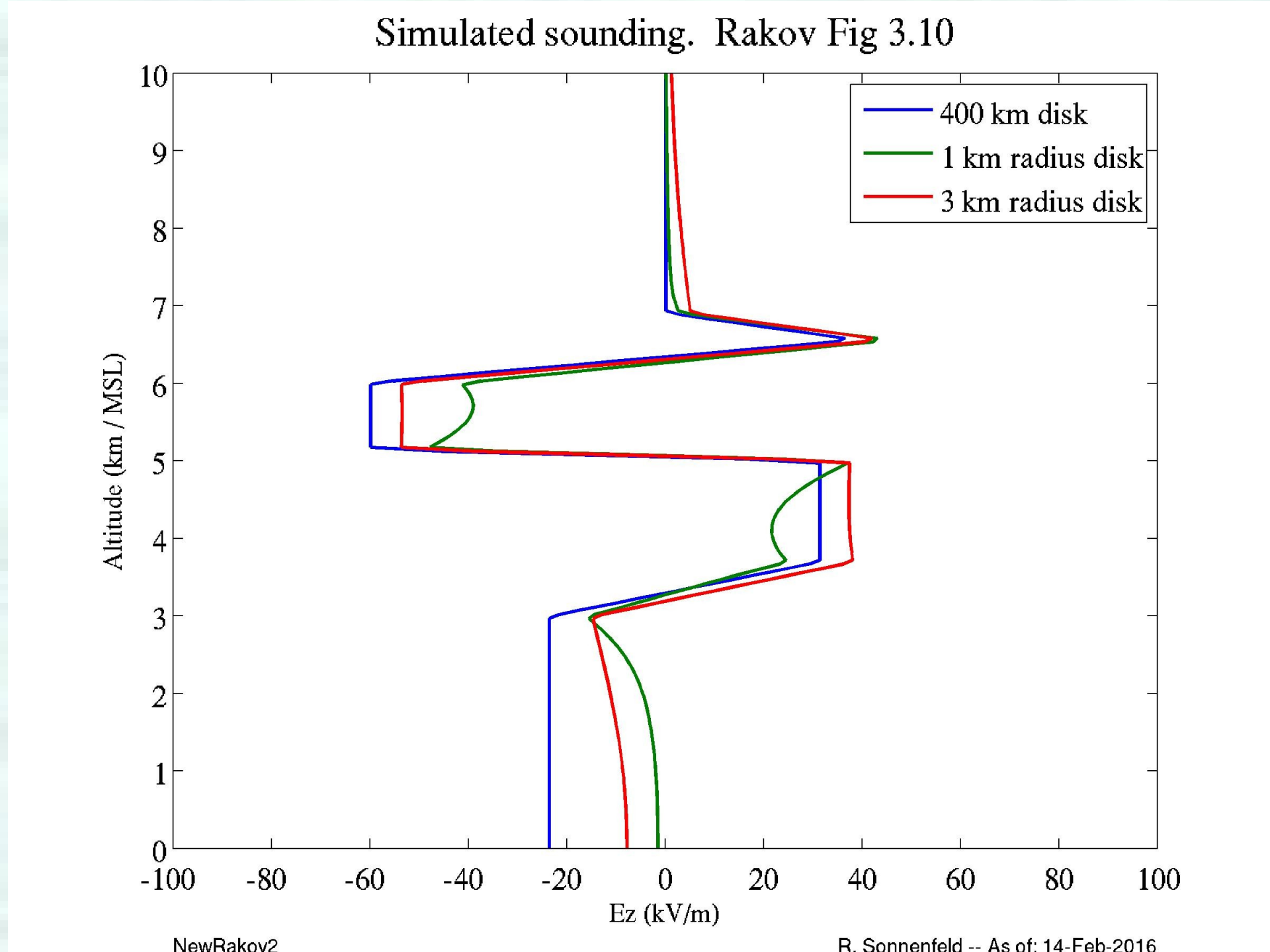

Simulated sounding. July 31, 1999 Storm over LL
This is the correct solution
For problem 4-3
E (kV/m)
Phi (MV)
RHO, 10*nC/m3
Altitude (km / AGL)
12
10
8
6
4
2
0
-150
-100
-50
0
50
100
150
LL 19990731
R. Sonnenfeld -- As of: 15-Feb-2016


Simulated sounding. Rakov Fig 3.10
3 km radius disk
Altitude (km / AGL)
Phi (MV)
0
1
2
3
4
5
6
7
8
9
10
-30
-20
-10
0
10
20
30
40
StormSim1
R. Sonnenfeld -- As of: 15-Feb-2016

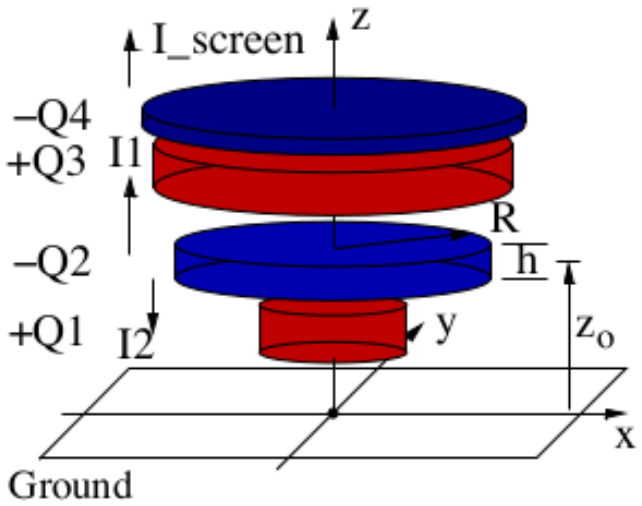

Altitude (km)
Radius (m)
Rho (nC/m^3)
Q (C)
StormSim1
R. Sonnenfeld -- As of: 14-Feb-2016


Simulated sounding. Rakov Fig 3.10
3 km radius disk
Altitude (km / AGL)
Ez (kV/m)
10
9
8
7
6
5
4
3
2
1
0
-100
-80
-60
-40
-20
0
20
40
60
80
100
StormSim1
R. Sonnenfeld -- As of: 14-Feb-2016


Simulated sounding. Rakov Fig 3.10
100 km disk
1 km radius disk
3 km radius disk
Altitude (km / MSL)
Ez (kV/m)
10
9
8
7
6
5
4
3
2
1
0
-100
-80
-60
-40
-20
0
20
40
60
80
100
NewRakov
R. Sonnenfeld -- As of: 14-Feb-2016

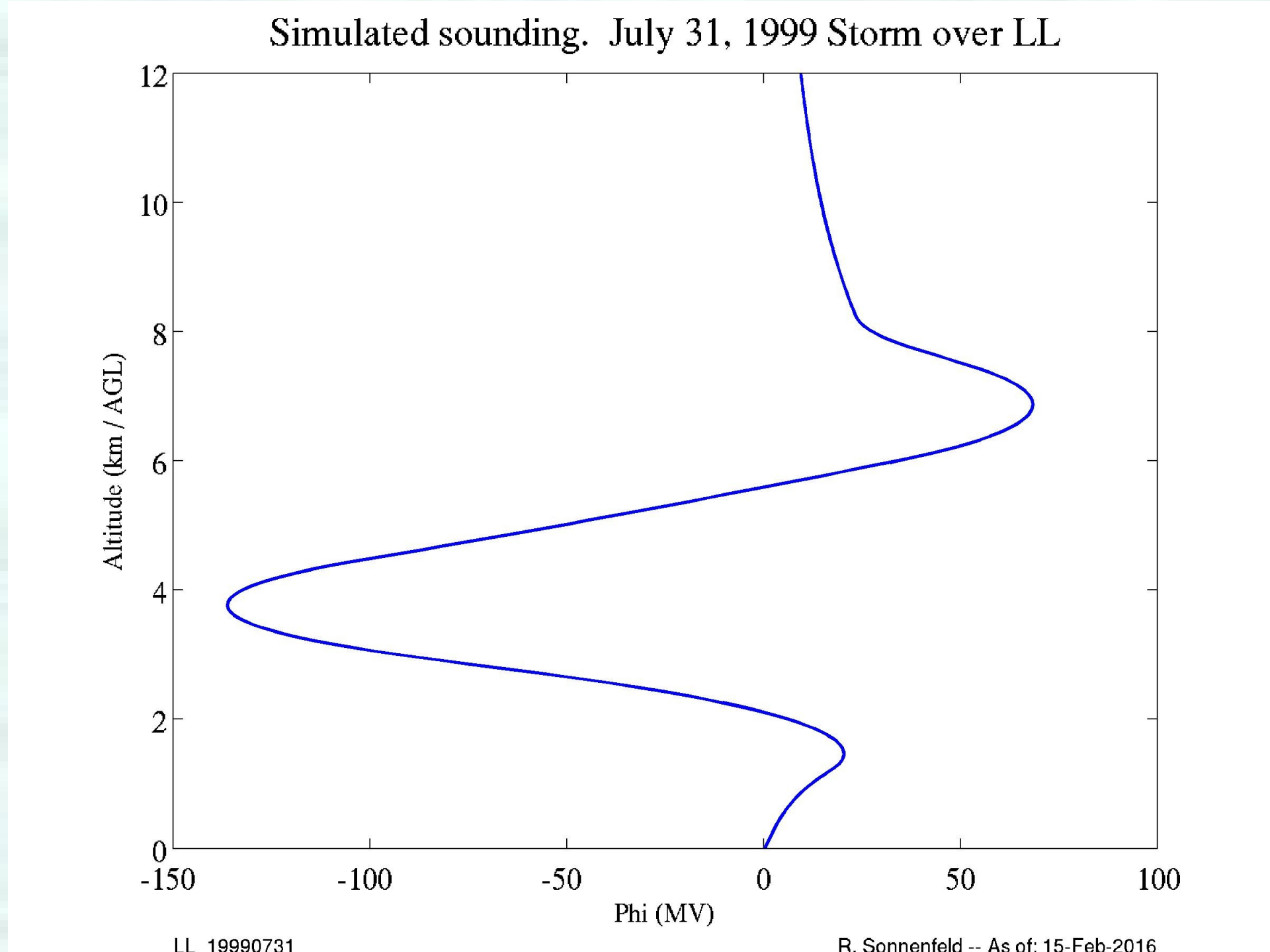

Simulated sounding. Rakov Fig 3.10
400 km disk
1 km radius disk
3 km radius disk
Altitude (km / MSL)
Ez (kV/m)
10
9
8
7
6
5
4
3
2
1
0
-100
-80
-60
-40
-20
0
20
40
60
80
100
NewRakov2
R. Sonnenfeld -- As of: 14-Feb-2016

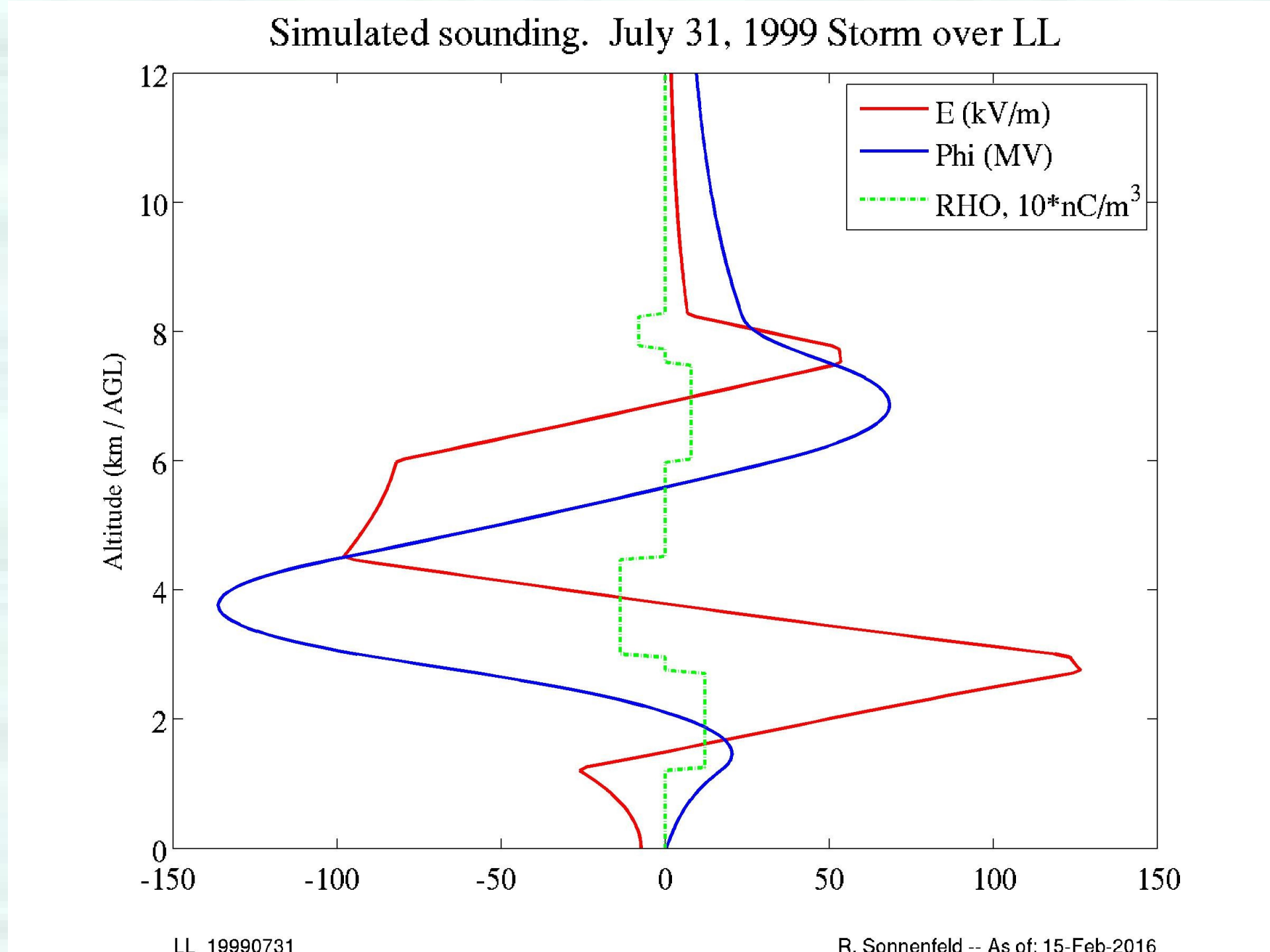
Homework 4 and 5

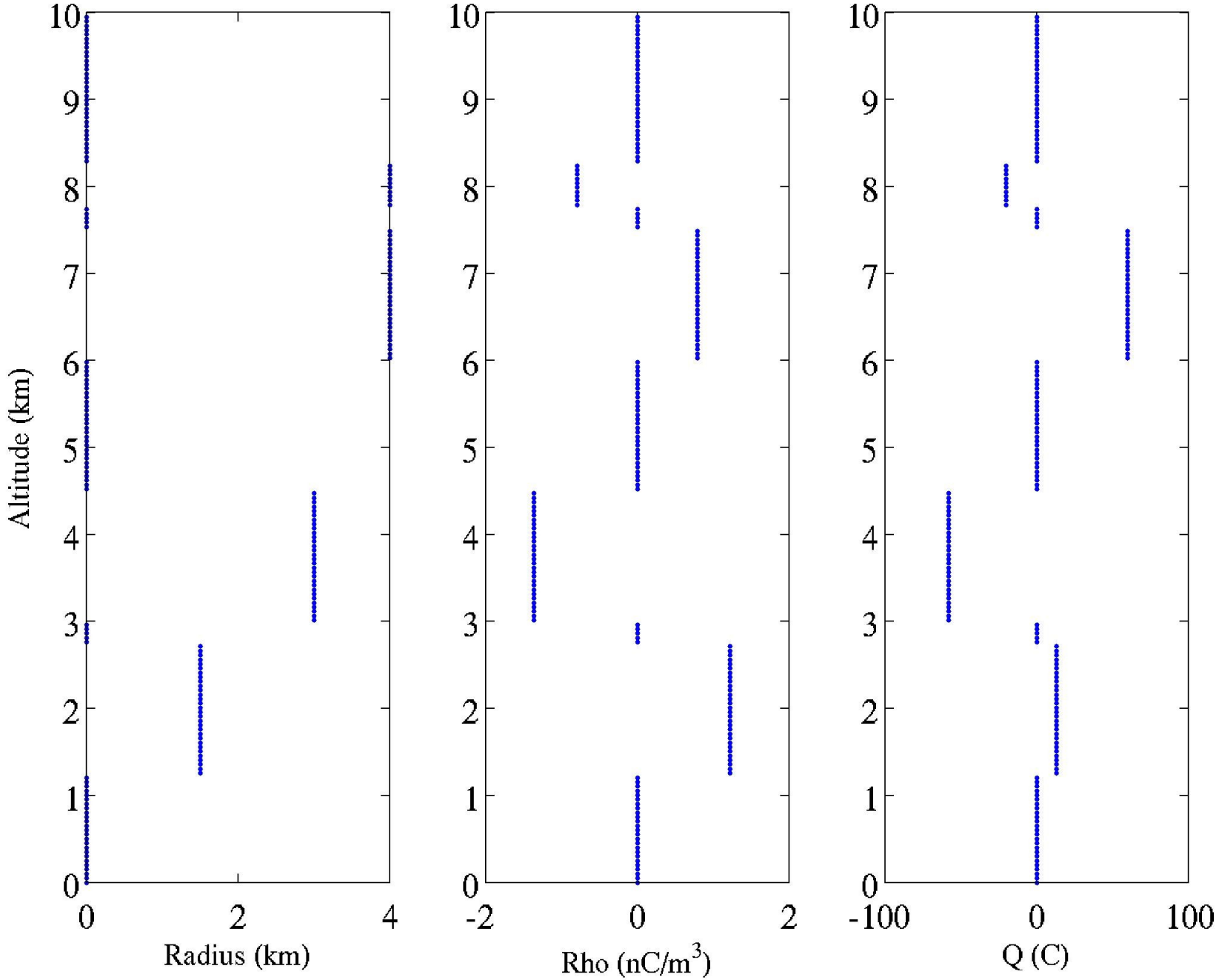


MODEL

Figure 1. 4-charge disk model. Each disk is specified by z_0, h, R, and Q. Current I_1 increases the main negative and upper postive charges, while I_2 increases the lower positive and main negative charges.


Simulated sounding. July 31, 1999 Storm over LL
Altitude (km / AGL)
12
10
8
6
4
2
0
-150
-100
-50
0
50
100
Phi (MV)
LL 19990731
R. Sonnenfeld -- As of: 15-Feb-2016


Simulated sounding. July 31, 1999 Storm over LL
E (kV/m)
Phi (MV)
RHO, 10*nC/m3
Altitude (km / AGL)
12
10
8
6
4
2
0
-150
-100
-50
0
50
100
150
LL 19990731
R. Sonnenfeld -- As of: 15-Feb-2016


Altitude (km)
Radius (km)
Rho (nC/m3)
Q (C)
LL 19990731
R. Sonnenfeld -- As of: 14-Feb-2016