

# NL potential flow

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +1000

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_35_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, LGWSHD
TSTEP = 0.2 s
SIPR = 90000 Pa SITR = 239 K SITRA = 239 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELX = 20 m DELZ = 20 m
REPONBT = 450 m REPOPTP = 750 m REPOPTAU = 1.0 s
HDIRDIV = 0 HDIRVOR = 0
HDIRVD = 0 HDIRT = 0
    
```

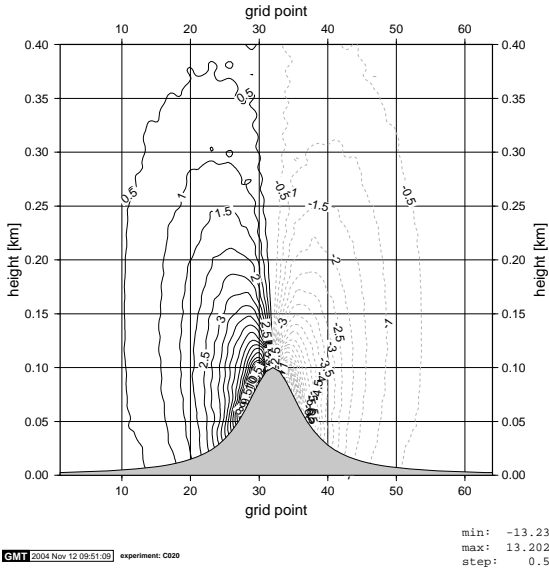


Fig. 1: euler, no HD.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +0200

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_35_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULL, LGWADV, LGWSHD
TSTEP = 1.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 100 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELX = 20 m DELZ = 20 m
REPONBT = 450 m REPOPTP = 750 m REPOPTAU = 1.0 s
HDIRDIV = 0 HDIRVOR = 0
HDIRVD = 0 HDIRT = 0
    
```

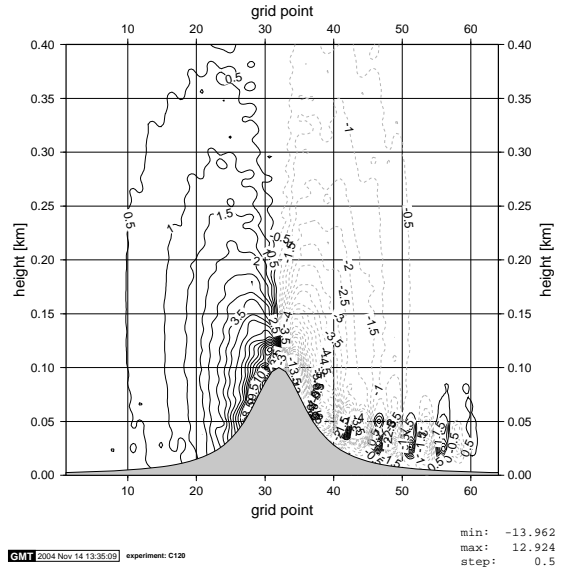


Fig. 2: sl2tl, no HD.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +1000

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_35_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, LGWSHD
TSTEP = 0.2 s
SIPR = 90000 Pa SITR = 239 K SITRA = 239 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELX = 20 m DELZ = 20 m
REPONBT = 450 m REPOPTP = 750 m REPOPTAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

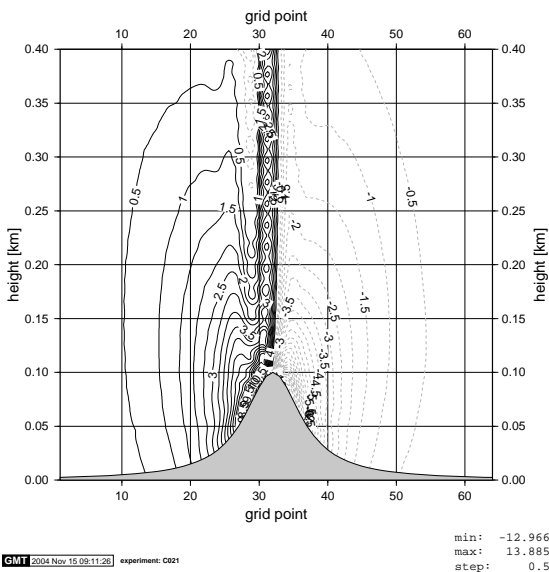


Fig. 3: euler, old HD treatment.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +0200

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_35_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULL, LGWADV, LGWSHD
TSTEP = 1.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 100 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELX = 20 m DELZ = 20 m
REPONBT = 450 m REPOPTP = 750 m REPOPTAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

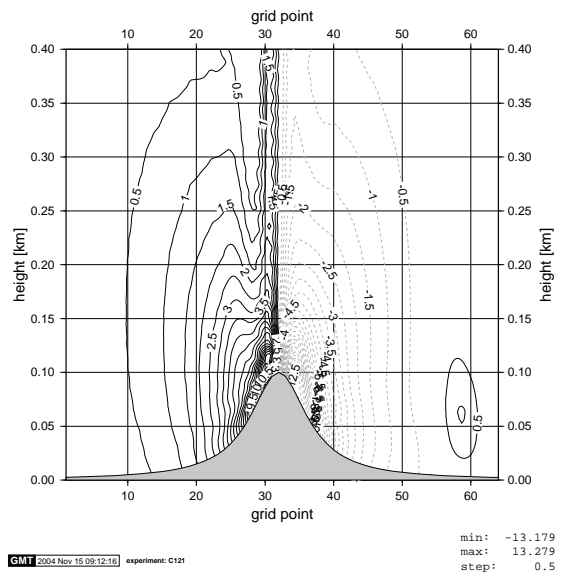


Fig. 4: sl2tl, old HD treatment.

# NL potential flow

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +1000

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_38_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, .NOT.LGWSHD
TSTEP = 0.2 s
SIPR = 90000 Pa SITR = 239 K SITRA = 239 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELX = 20 m DELZ = 20 m
REPONBT = 450 m REPOPTP = 750 m REPOPTAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

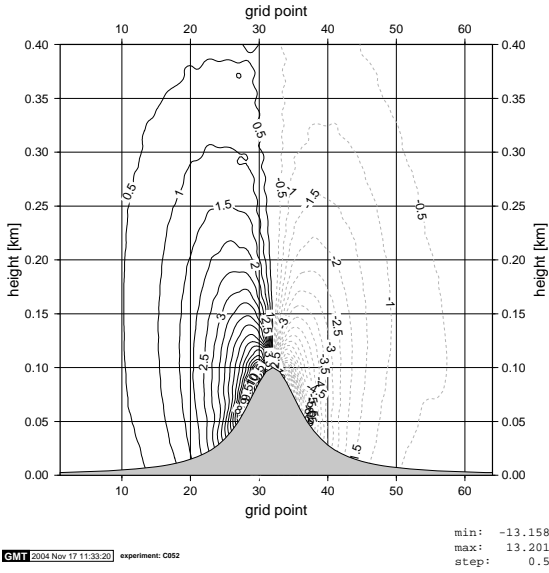


Fig. 5: euler, HD on  $w$  without  $w_{\tilde{L}}$ .

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +0200

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_38_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULLL, LGWADV, .NOT.LGWSHD
TSTEP = 1.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 100 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELX = 20 m DELZ = 20 m
REPONBT = 450 m REPOPTP = 750 m REPOPTAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

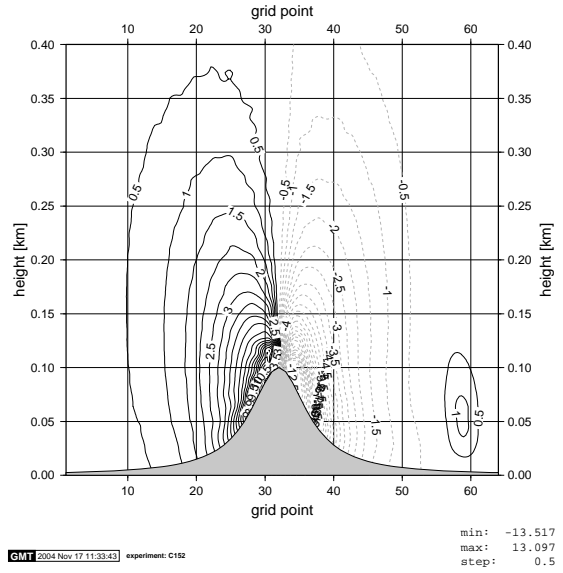


Fig. 6: sl2tl, HD on  $w$  without  $w_{\tilde{L}}$ .

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +1000

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_37_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, .NOT.LGWSHD
TSTEP = 0.2 s
SIPR = 90000 Pa SITR = 239 K SITRA = 239 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELX = 20 m DELZ = 20 m
REPONBT = 450 m REPOPTP = 750 m REPOPTAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

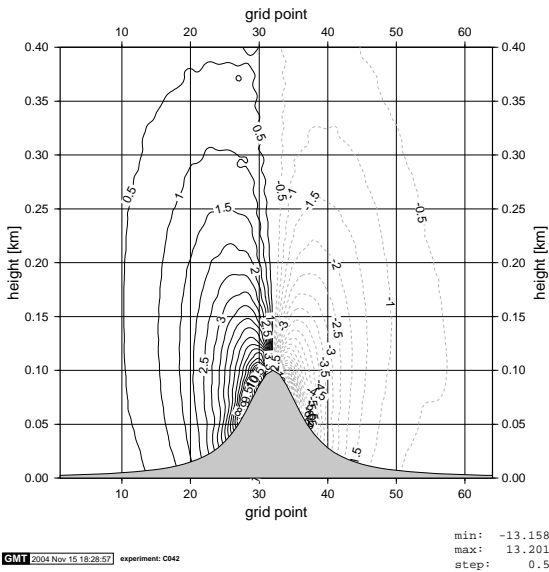


Fig. 7: euler, exact HD treatment.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +0200

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_37_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULLL, LGWADV, .NOT.LGWSHD
TSTEP = 1.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 100 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELX = 20 m DELZ = 20 m
REPONBT = 450 m REPOPTP = 750 m REPOPTAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

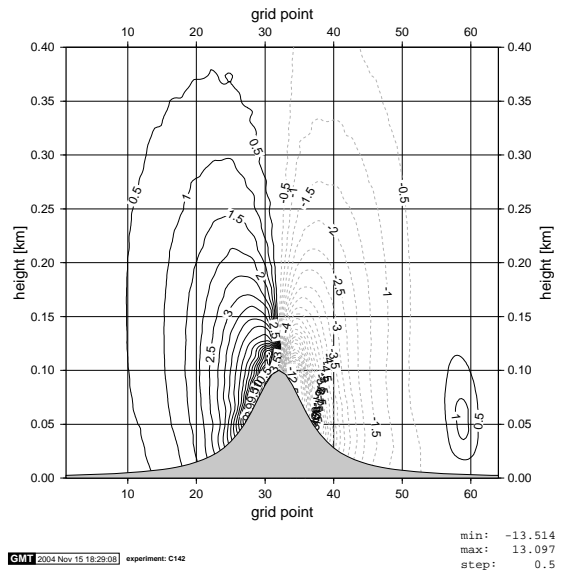


Fig. 8: sl2tl, exact HD treatment.

# NL potential flow

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +1000

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_35_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, .NOT.LGWSHD
TSTEP = 0.2 s
SIPR = 90000 Pa SITR = 239 K SITRA = 239 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELY = 20 m DELZ = 20 m
REPONBT = 450 m REPOntp = 750 m REPOntau = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

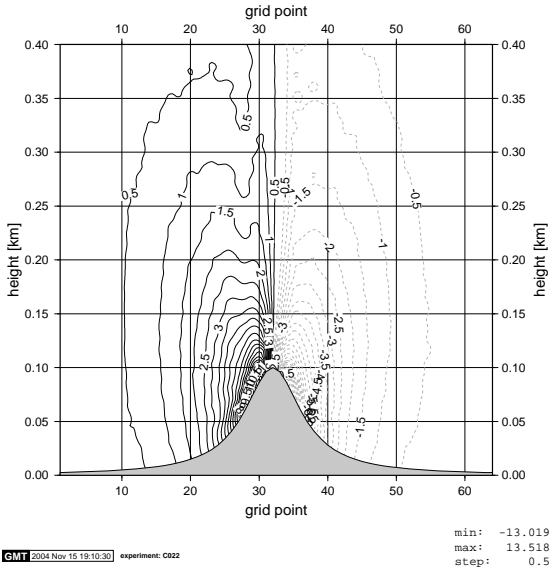


Fig. 9: euler, approximate HD treatment 2.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +0200

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_35_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULL, LGWADV, .NOT.LGWSHD
TSTEP = 1.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 100 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELY = 20 m DELZ = 20 m
REPONBT = 450 m REPOntp = 750 m REPOntau = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

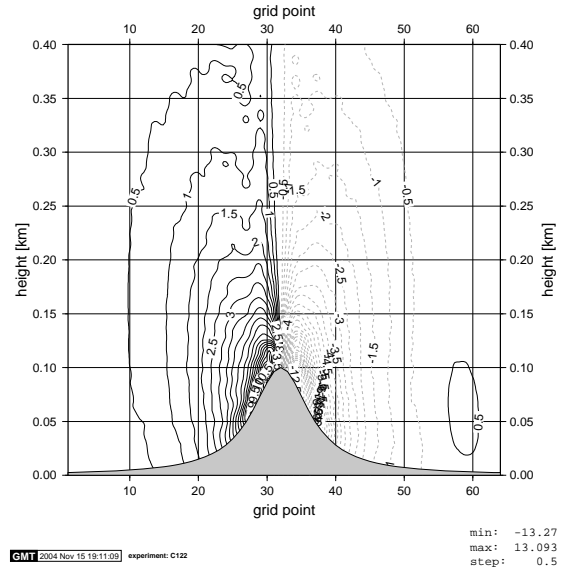


Fig. 10: sl2tl, approximate HD treatment 2.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +1000

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_36_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, .NOT.LGWSHD
TSTEP = 0.2 s
SIPR = 90000 Pa SITR = 239 K SITRA = 239 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELY = 20 m DELZ = 20 m
REPONBT = 450 m REPOntp = 750 m REPOntau = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

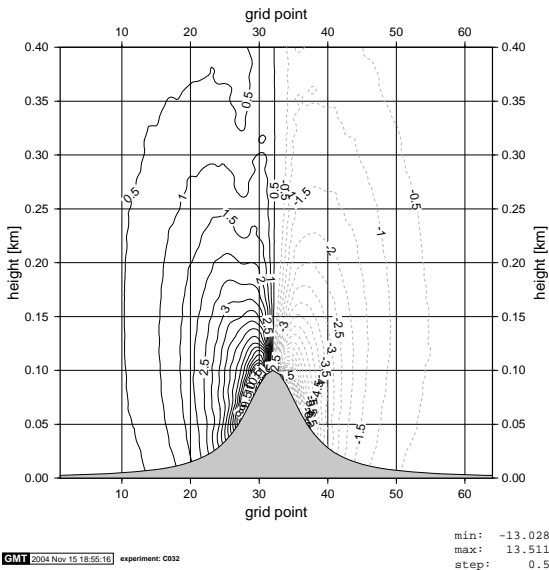


Fig. 11: euler, approximate HD treatment 3.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +0200

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_36_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULL, LGWADV, .NOT.LGWSHD
TSTEP = 1.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 100 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELY = 20 m DELZ = 20 m
REPONBT = 450 m REPOntp = 750 m REPOntau = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

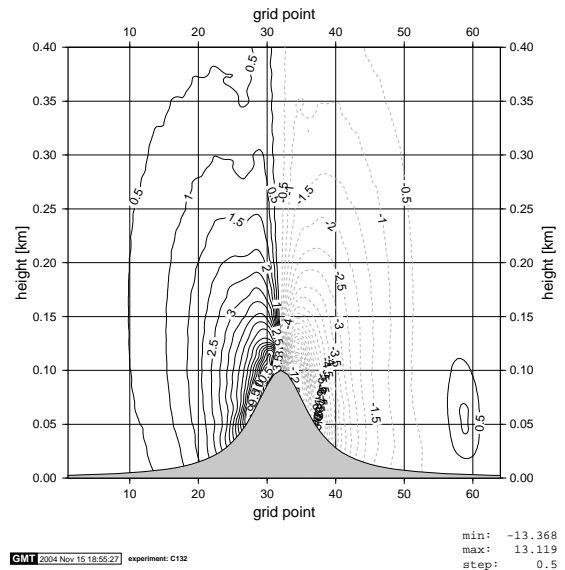


Fig. 12: sl2tl, approximate HD treatment 3.

# NL potential flow

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +1000

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_39_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, .NOT.LGWSHD
TSTEP = 0.2 s
SIPR = 90000 Pa SITR = 239 K SITRA = 239 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELY = 20 m DELZ = 20 m
REPONBT = 450 m REPOntp = 750 m REPOntAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

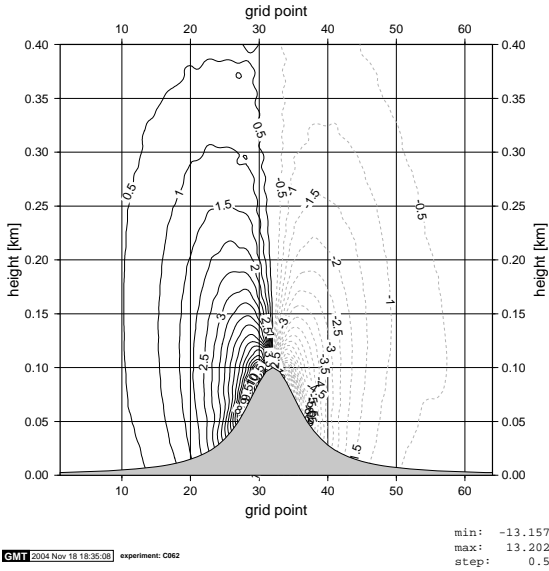


Fig. 13: euler, approximate HD treatment 4.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +0200

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_39_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULL, LPC_NESC, LGWADV, .NOT.LGWSHD
TSTEP = 1.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 100 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELY = 20 m DELZ = 20 m
REPONBT = 450 m REPOntp = 750 m REPOntAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

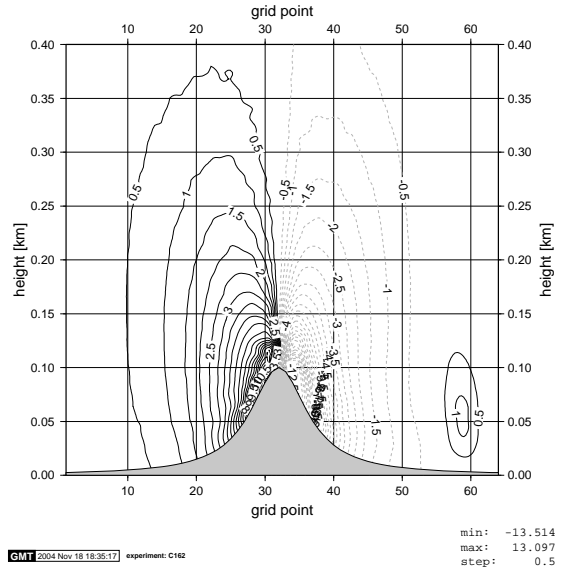


Fig. 14: sl2tl, approximate HD treatment 4.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +1000

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_39b_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, .NOT.LGWSHD
TSTEP = 0.2 s
SIPR = 90000 Pa SITR = 239 K SITRA = 239 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELY = 20 m DELZ = 20 m
REPONBT = 450 m REPOntp = 750 m REPOntAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

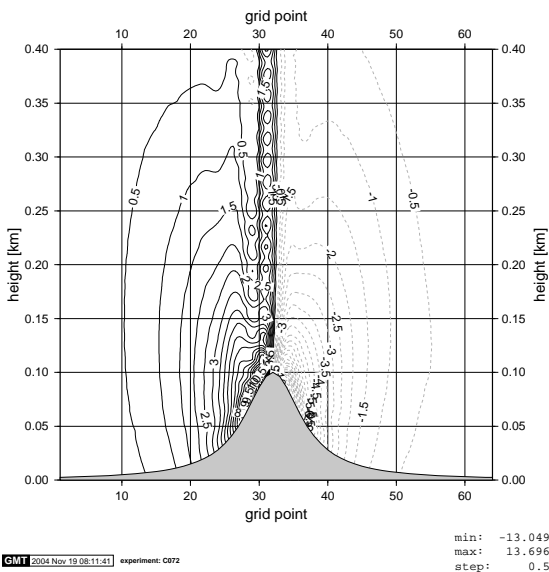


Fig. 15: euler, approximate HD treatment 5.

POTENTIAL FLOW  
NH vertical velocity [m/s], NSTEP = +0200

```

init_101_potflow0, agnesi, sigma-coordinate, regular z-levels
master_al25t2_39b_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULL, LPC_NESC, LGWADV, .NOT.LGWSHD
TSTEP = 1.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 100 K
P00 = 101325 Pa T00 = 239 K V00 = 15 m/s
WIDTH = 100 m HEIGHT = 100 m POSITION = 32
DELY = 20 m DELZ = 20 m
REPONBT = 450 m REPOntp = 750 m REPOntAU = 1.0 s
HDIRDIV = 0.2 s HDIRVOR = 1.0 s
HDIRVD = 0.2 s HDIRT = 1.0 s
    
```

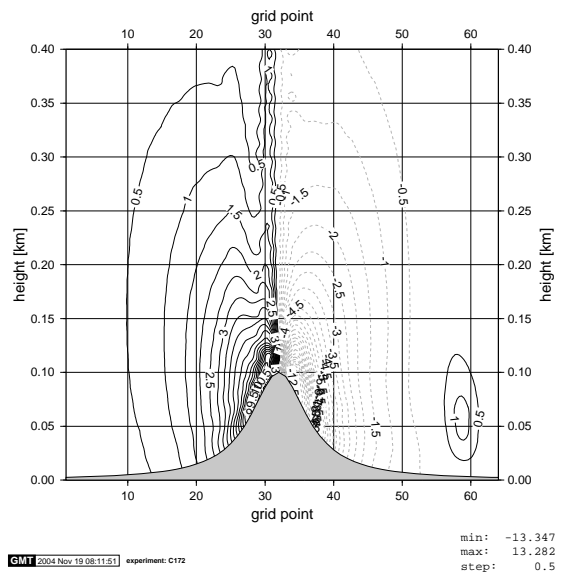


Fig. 16: sl2tl, approximate HD treatment 5.

# NLNH regime

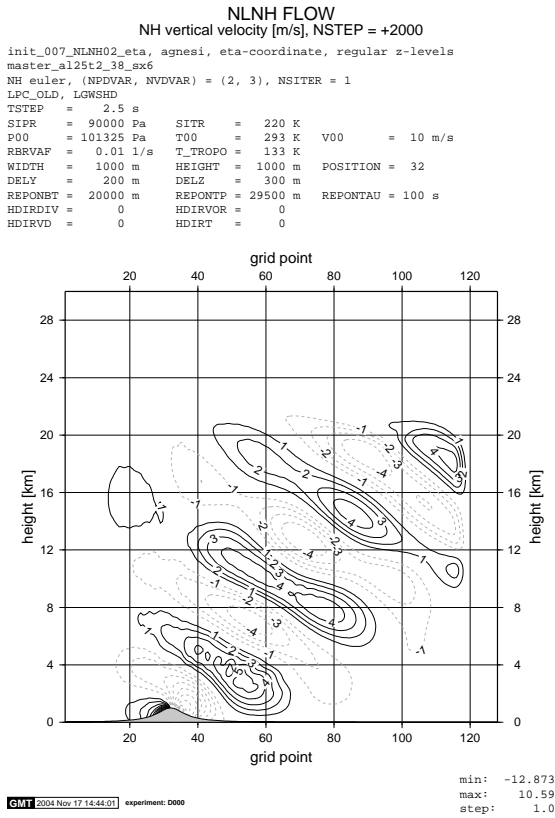


Fig. 17: euler, no HD.

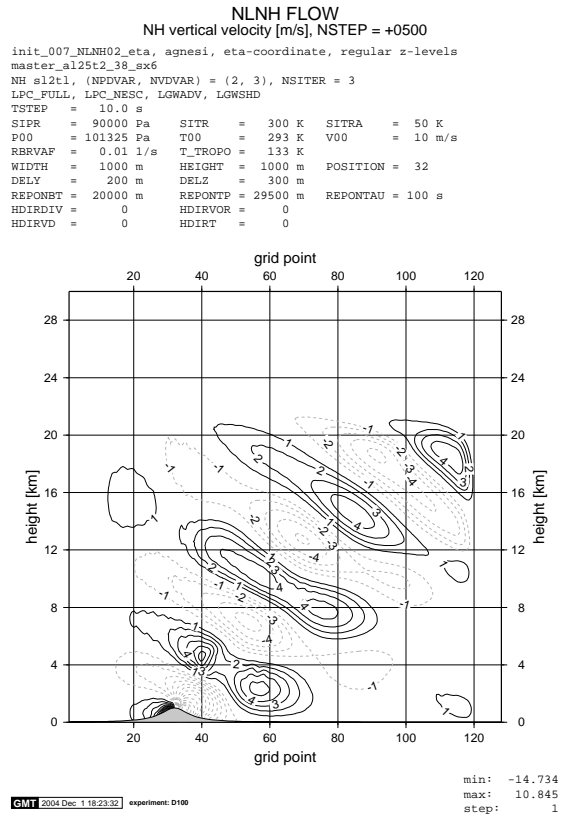


Fig. 18: sl2tl, no HD.

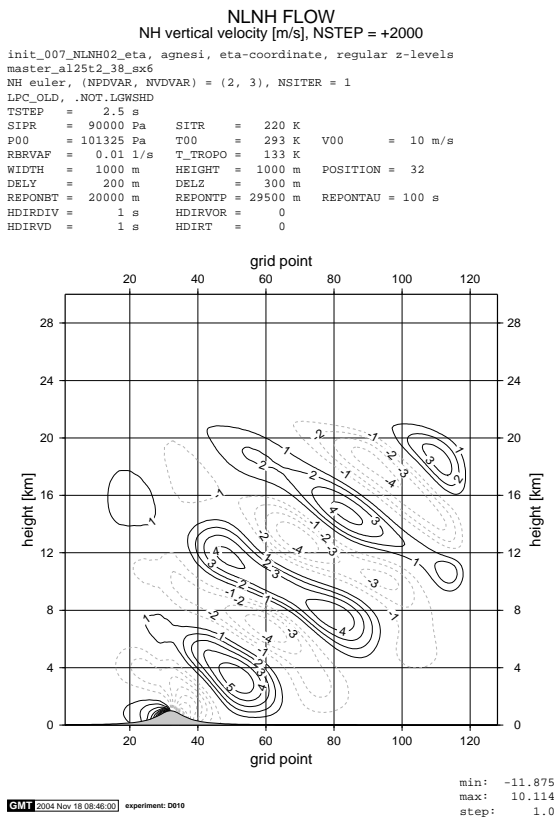


Fig. 19: euler, HD on  $w$  without  $w_{\tilde{L}}$ .

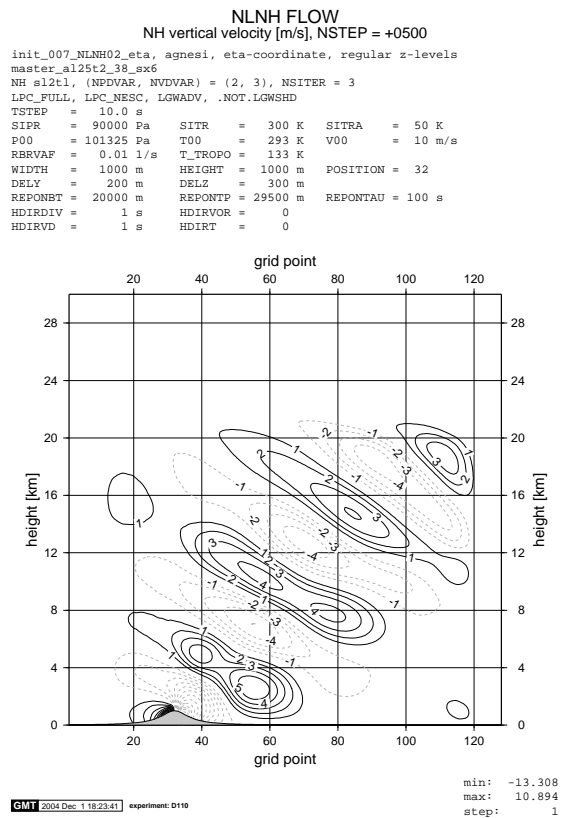
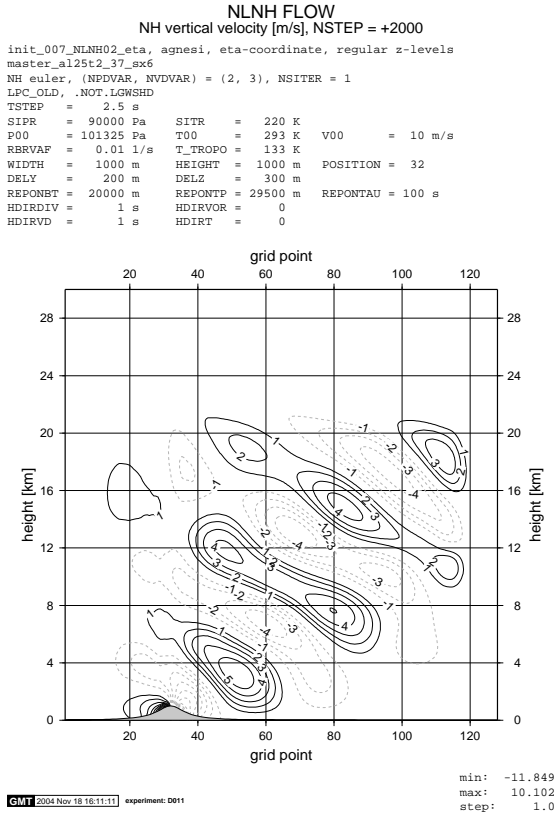
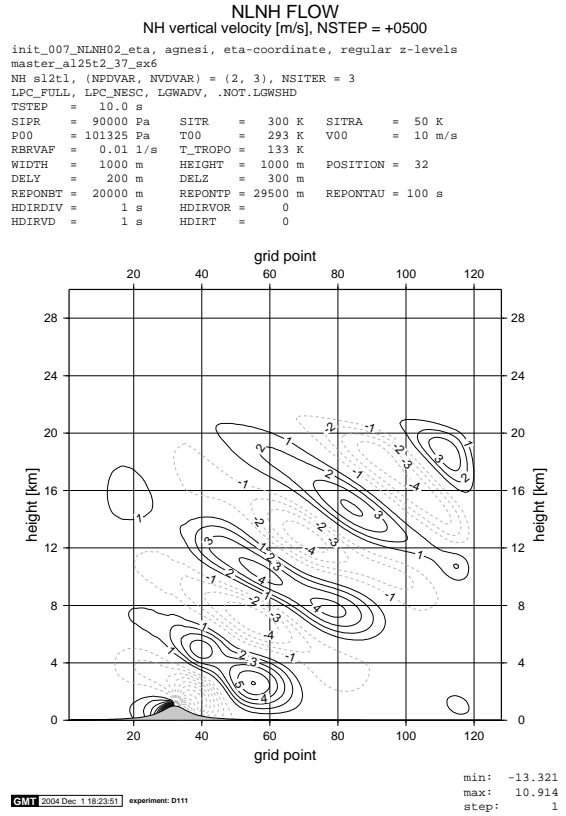


Fig. 20: sl2tl, HD on  $w$  without  $w_{\tilde{L}}$ .

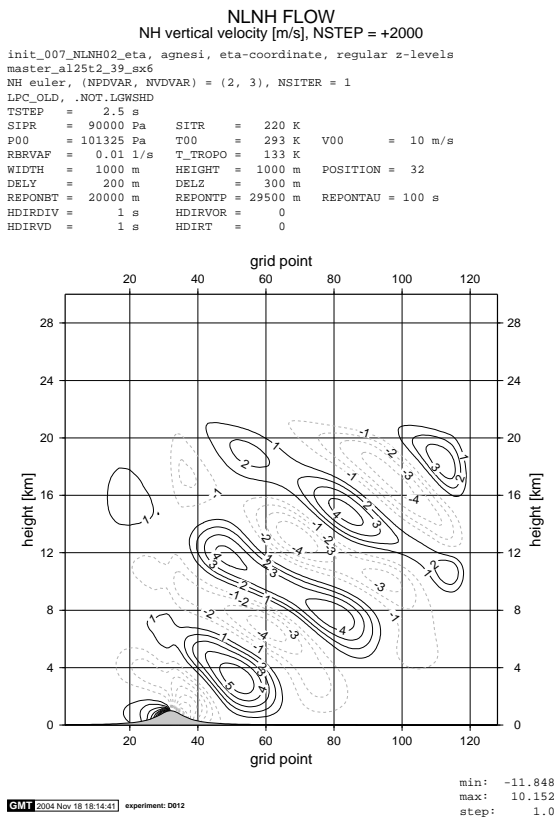
# NLNH regime



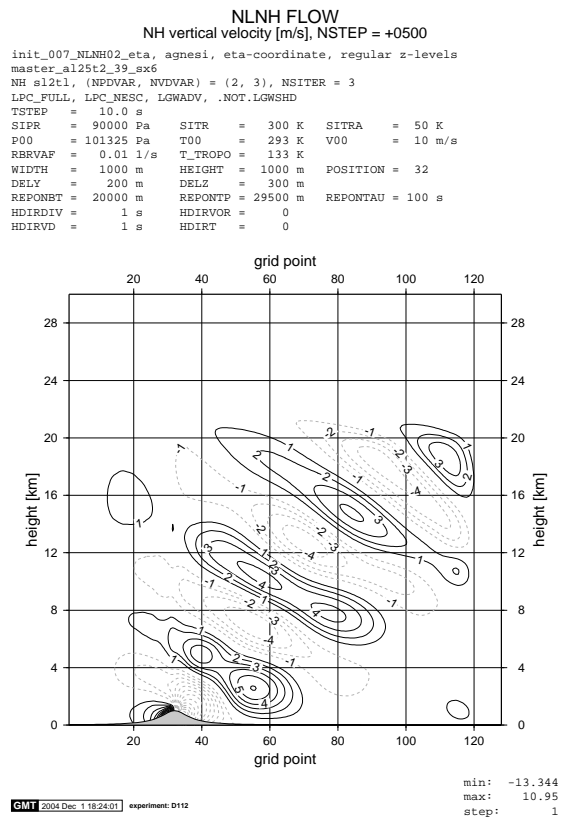
**Fig. 21:** euler, exact HD treatment.



**Fig. 22:** sl2tl, exact HD treatment.



**Fig. 23:** euler, approximate HD treatment 4.



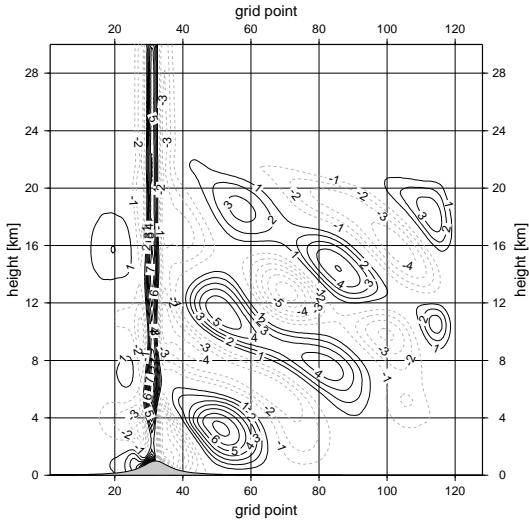
**Fig. 24:** sl2tl, approximate HD treatment 4.

# NLNH regime

**NLNH FLOW**  
NH vertical velocity [m/s], NSTEP = +2000

```

init_007_NLNH02_eta, agnesi, eta-coordinate, regular z-levels
master_al25t2_38_sx6
NH euler, (NPDVAR, NVDVAR) = (2, 3), NSITER = 1
LPC_OLD, LGWSHD
TSTEP = 2.5 s
SIPR = 90000 Pa SITR = 220 K
P00 = 101325 Pa T00 = 293 K V00 = 10 m/s
RBRVAF = 0.01 1/s T_TROPO = 133 K
WIDTH = 1000 m HEIGHT = 1000 m POSITION = 32
DELY = 200 m DELZ = 300 m
REPONBT = 20000 m REPONTP = 29500 m REPONTAU = 100 s
HDIRDIV = 1 s HDIRVOR = 0
HDIRVD = 1 s HDIRT = 0
    
```

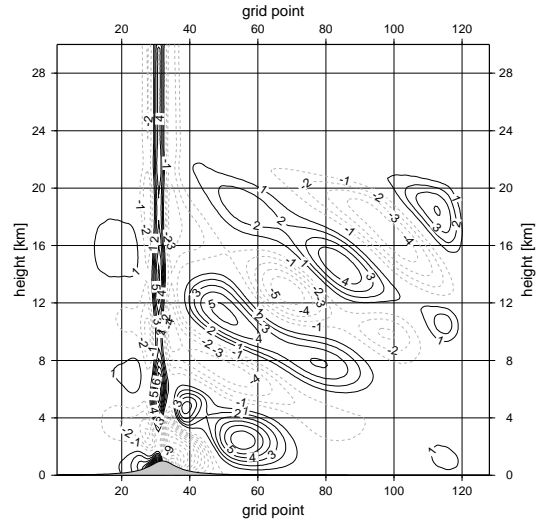


GMT 2004 Dec 1 17:47:26 experiment: D014  
min: -12.317  
max: 11.67  
step: 1

**NLNH FLOW**  
NH vertical velocity [m/s], NSTEP = +0500

```

init_007_NLNH02_eta, agnesi, eta-coordinate, regular z-levels
master_al25t2_38_sx6
NH sl2tl, (NPDVAR, NVDVAR) = (2, 3), NSITER = 3
LPC_FULL, LPC_NESC, LGWADV, LGWSHD
TSTEP = 10.0 s
SIPR = 90000 Pa SITR = 300 K SITRA = 50 K
P00 = 101325 Pa T00 = 293 K V00 = 10 m/s
RBRVAF = 0.01 1/s T_TROPO = 133 K
WIDTH = 1000 m HEIGHT = 1000 m POSITION = 32
DELY = 200 m DELZ = 300 m
REPONBT = 20000 m REPONTP = 29500 m REPONTAU = 100 s
HDIRDIV = 1 s HDIRVOR = 0
HDIRVD = 1 s HDIRT = 0
    
```



GMT 2004 Dec 1 18:24:23 experiment: D114  
min: -14.206  
max: 11.997  
step: 1

**Fig. 25:** euler, old HD treatment.

**Fig. 26:** sl2tl, old HD treatment.