The Lorenz energy cycle in simulated rotating annulus flows

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Supplementary Material

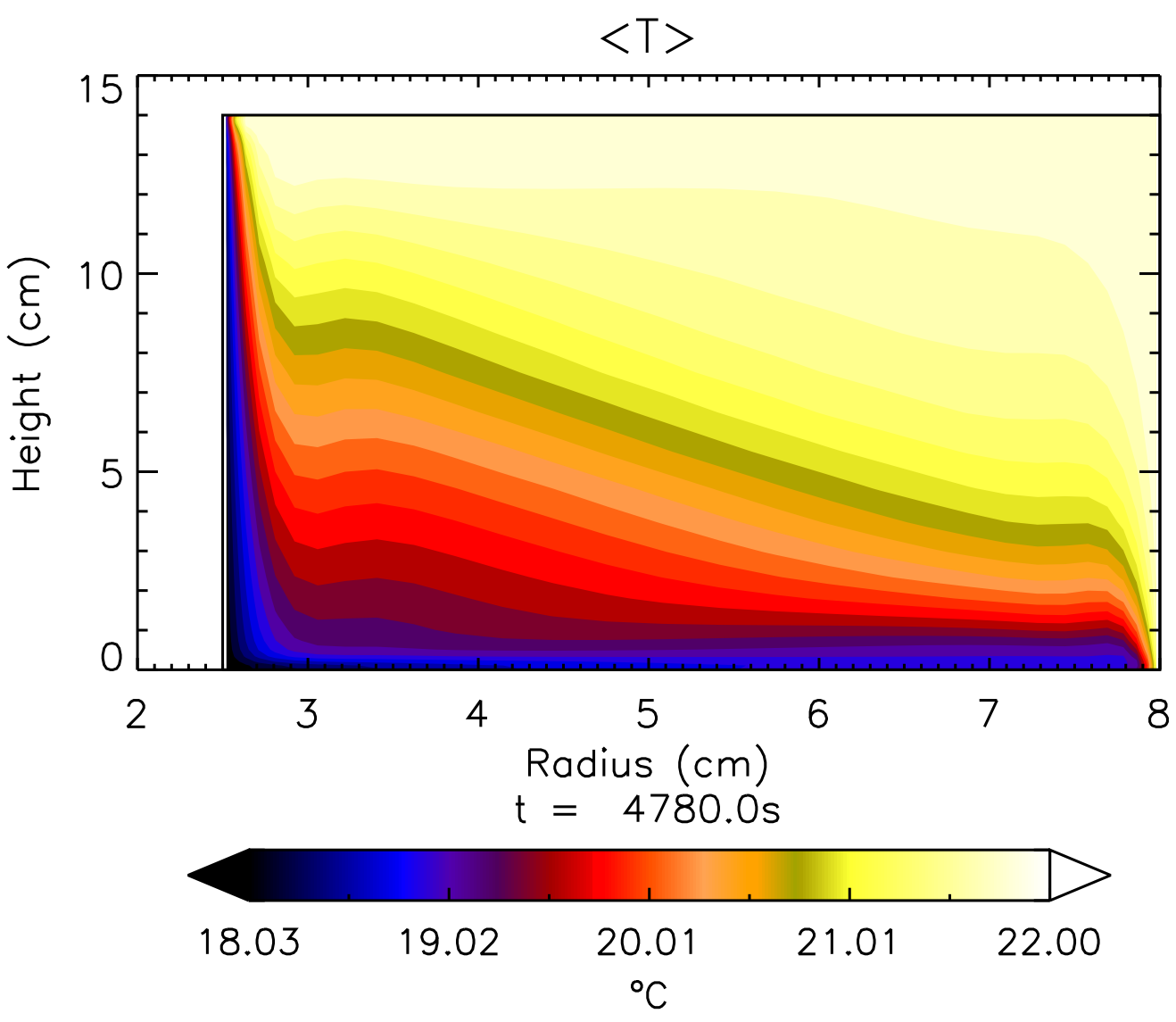
2AV run at 4780s (weakest eddies)

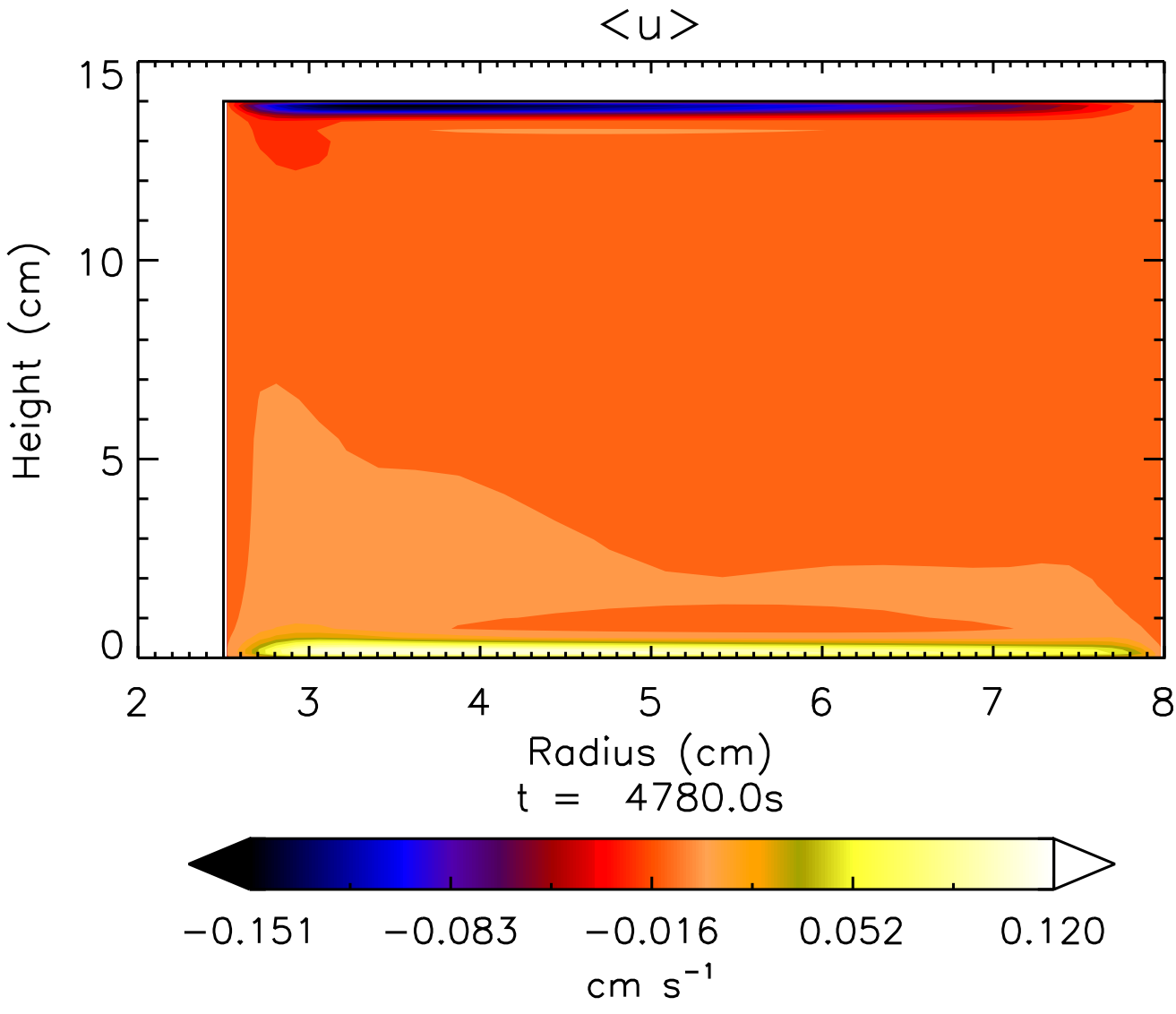
This file contains additional contour plots in the (R, z) plane, and line plots showing horizontal means as a function of z.

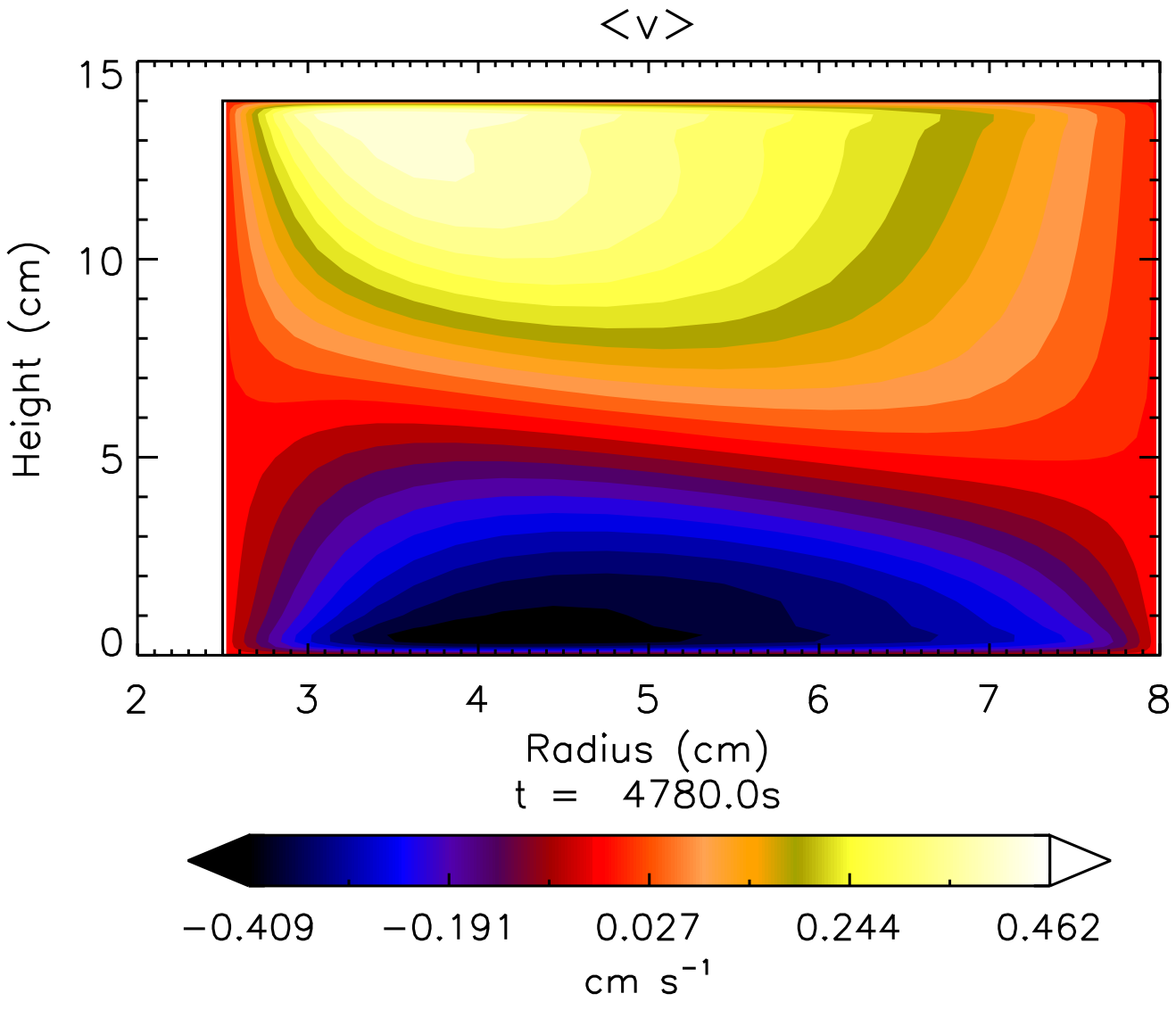
Because of limitations in the plotting language, the notation for means is different in this document compared with the main paper:

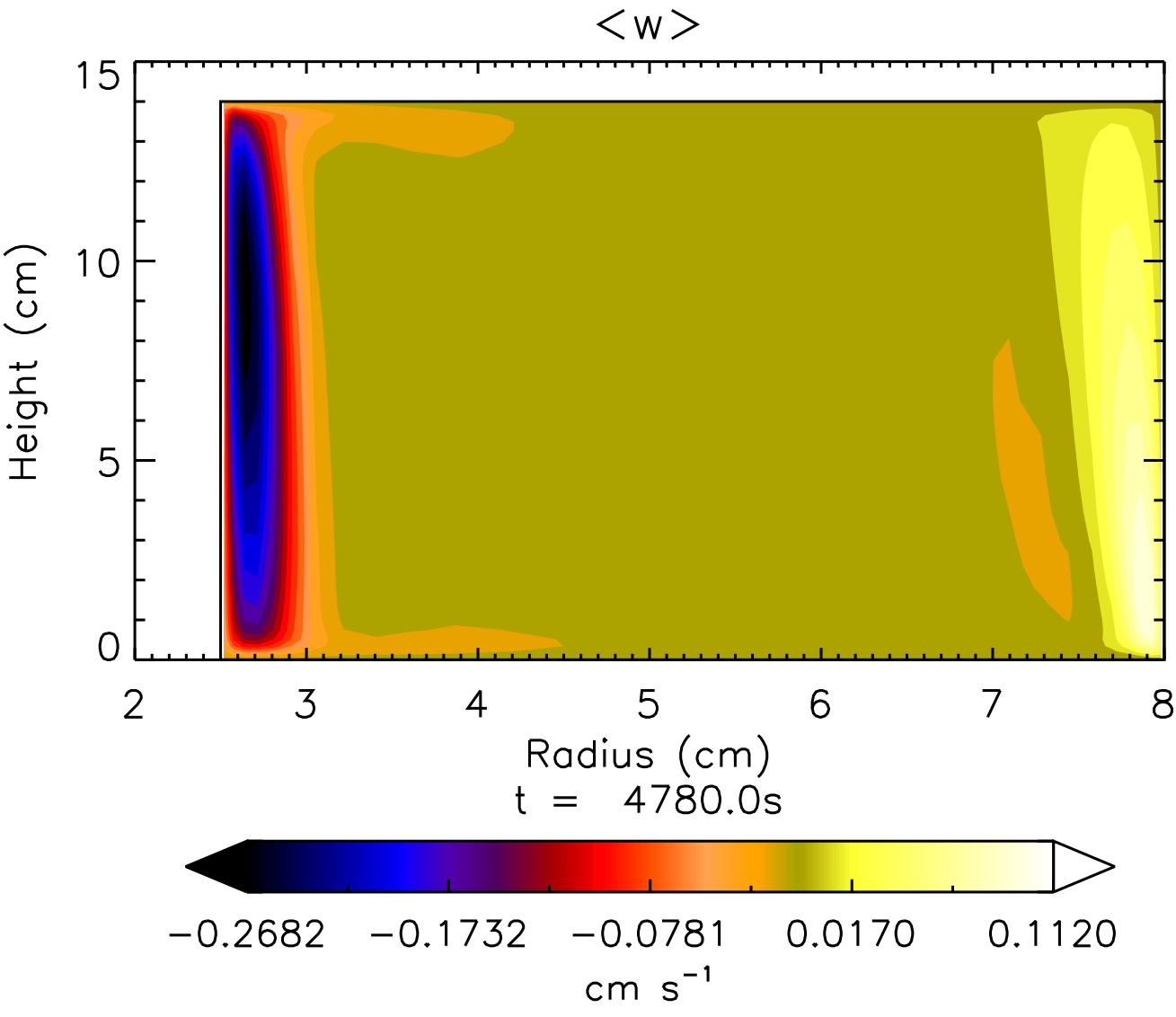
- A zonal or azimuthal mean is displayed as $\langle x \rangle$ ($\overline{x}$ in the main paper).
- A horizontal mean is displayed as $|x|$ ($\tilde{x}$ in the main paper).

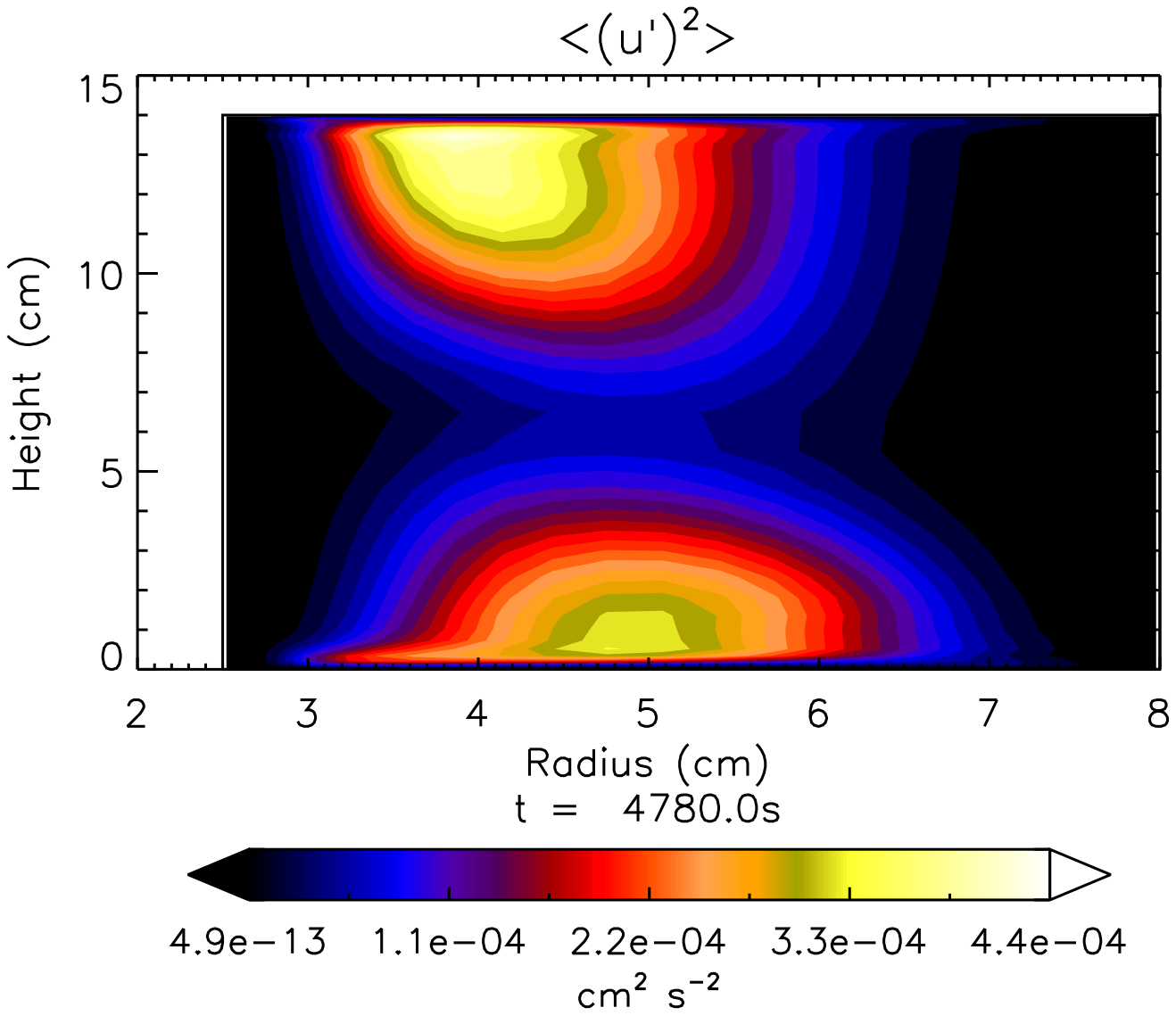
Eddy fields use the same notation as the main paper.

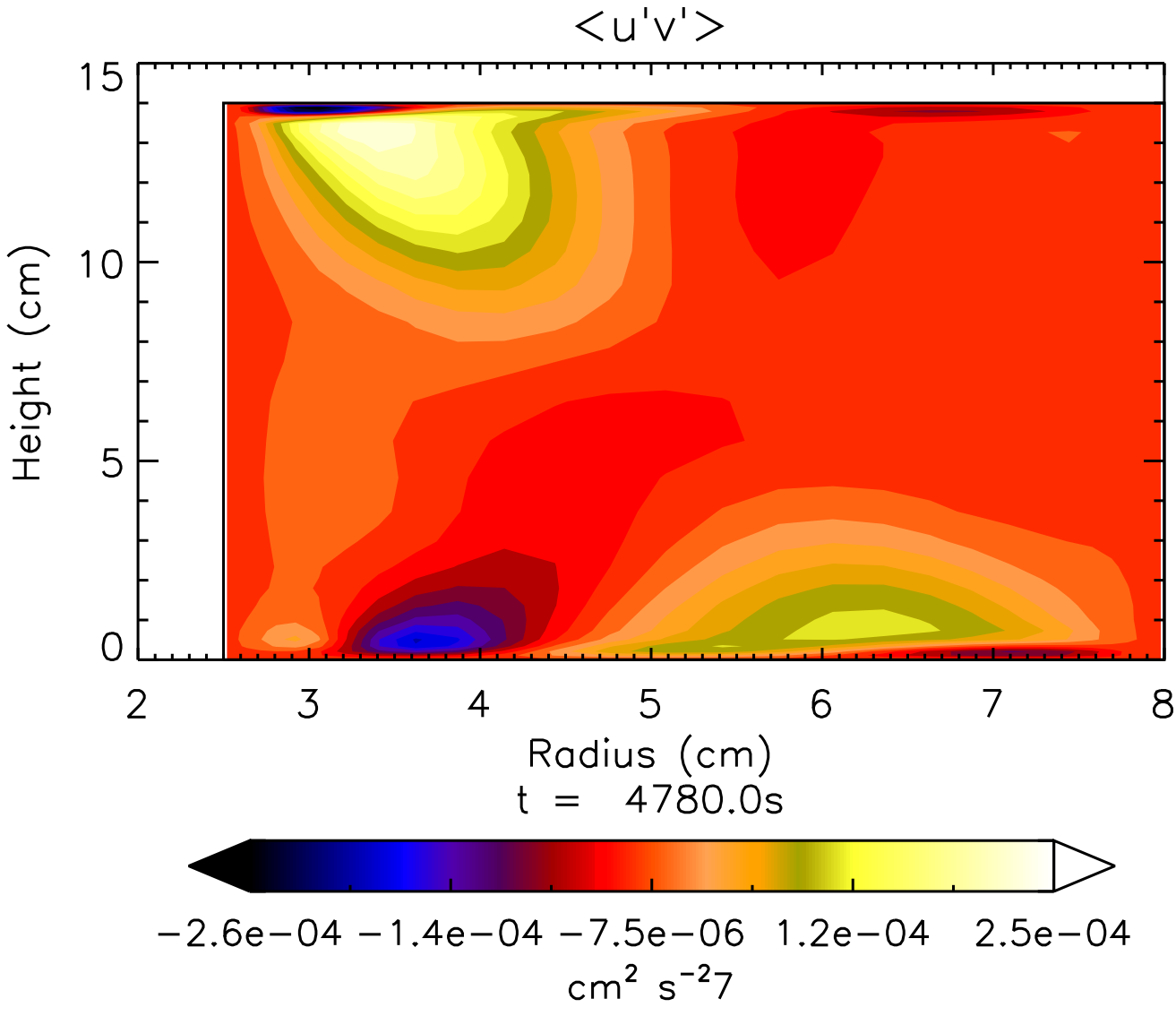

<T>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
18.03
19.02
20.01
21.01
22.00
°C

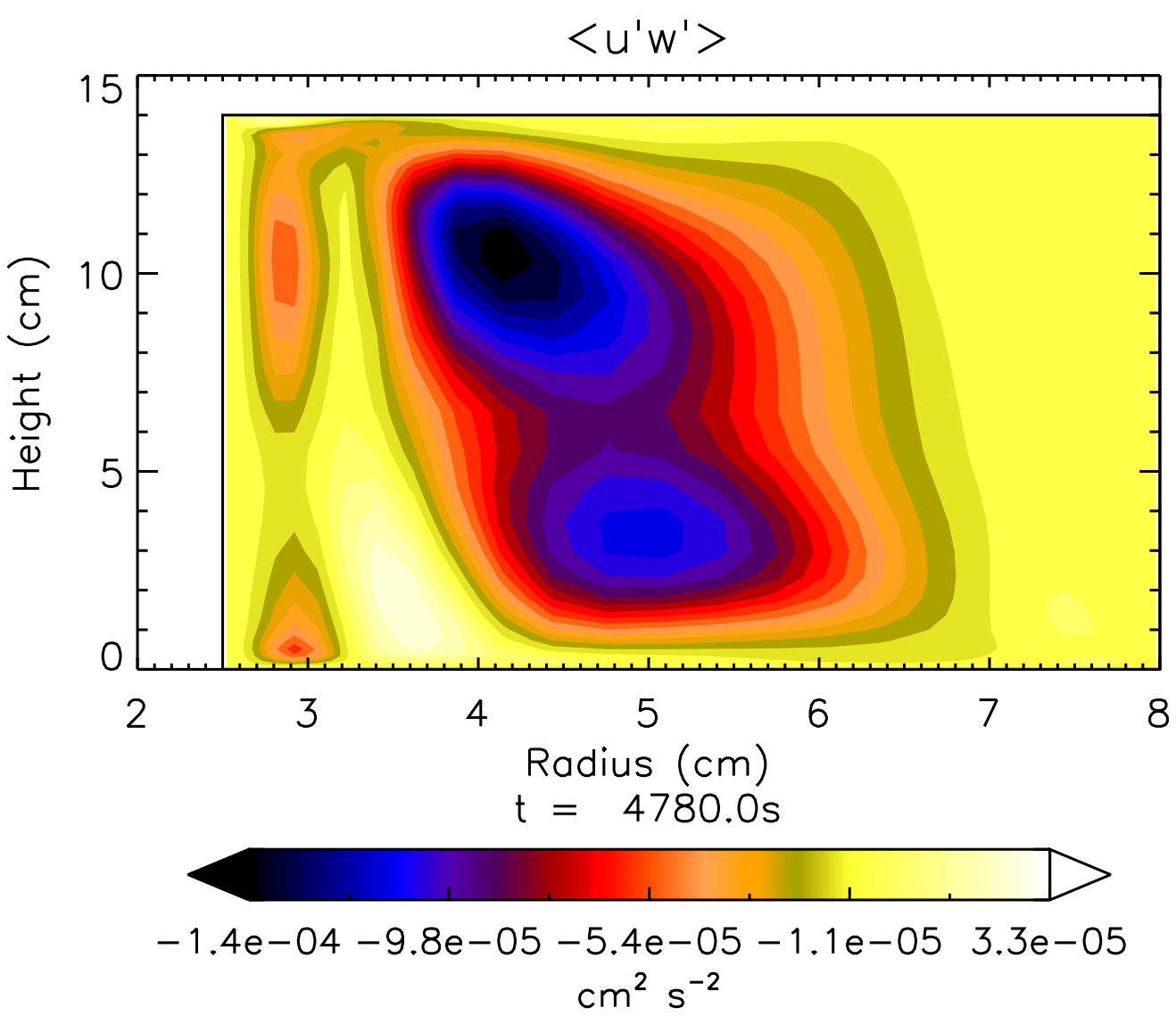

<u>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−0.151
−0.083
−0.016
0.052
0.120
cm s^{-1}

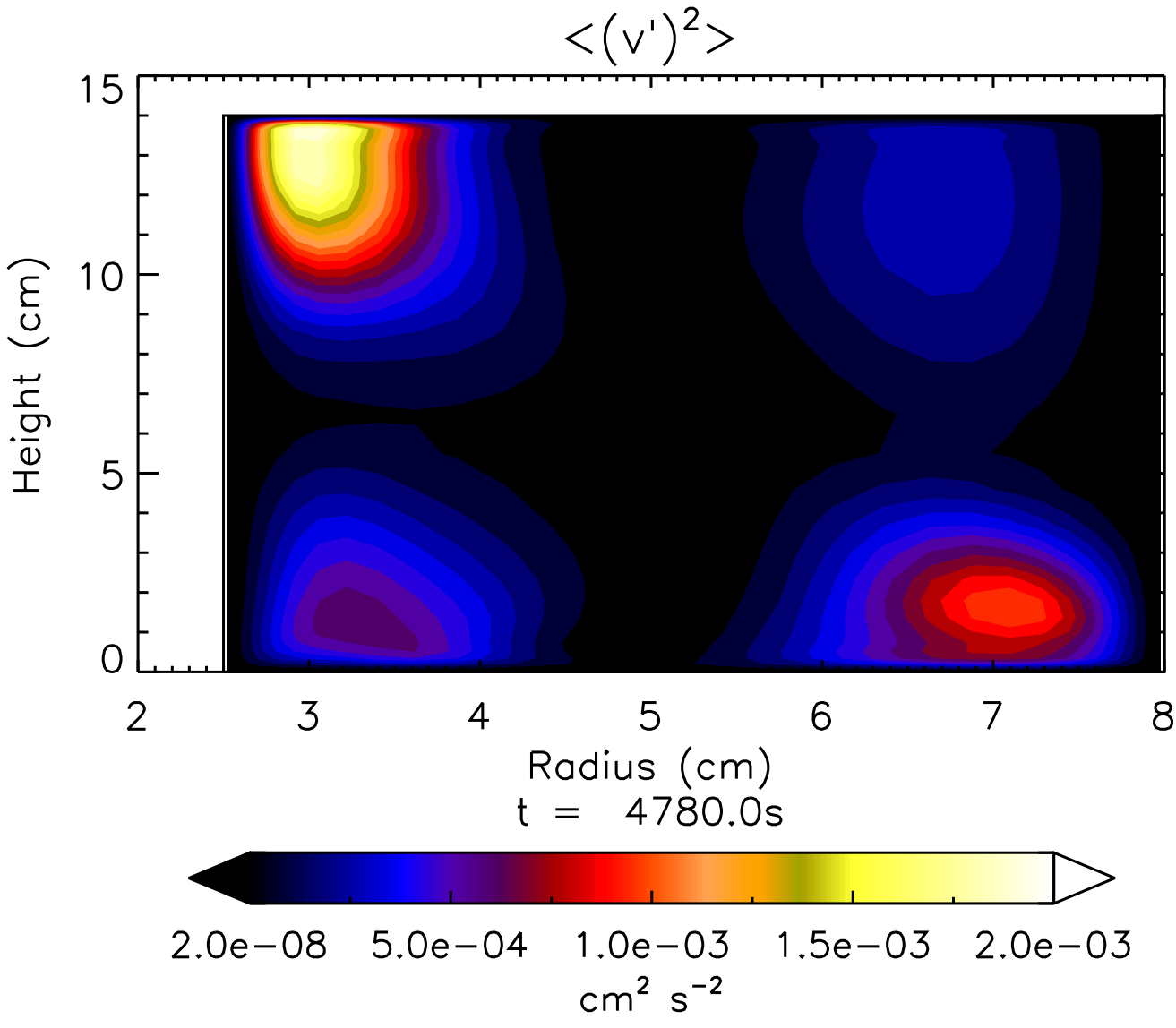

<v>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−0.409
−0.191
0.027
0.244
0.462
cm s⁻¹

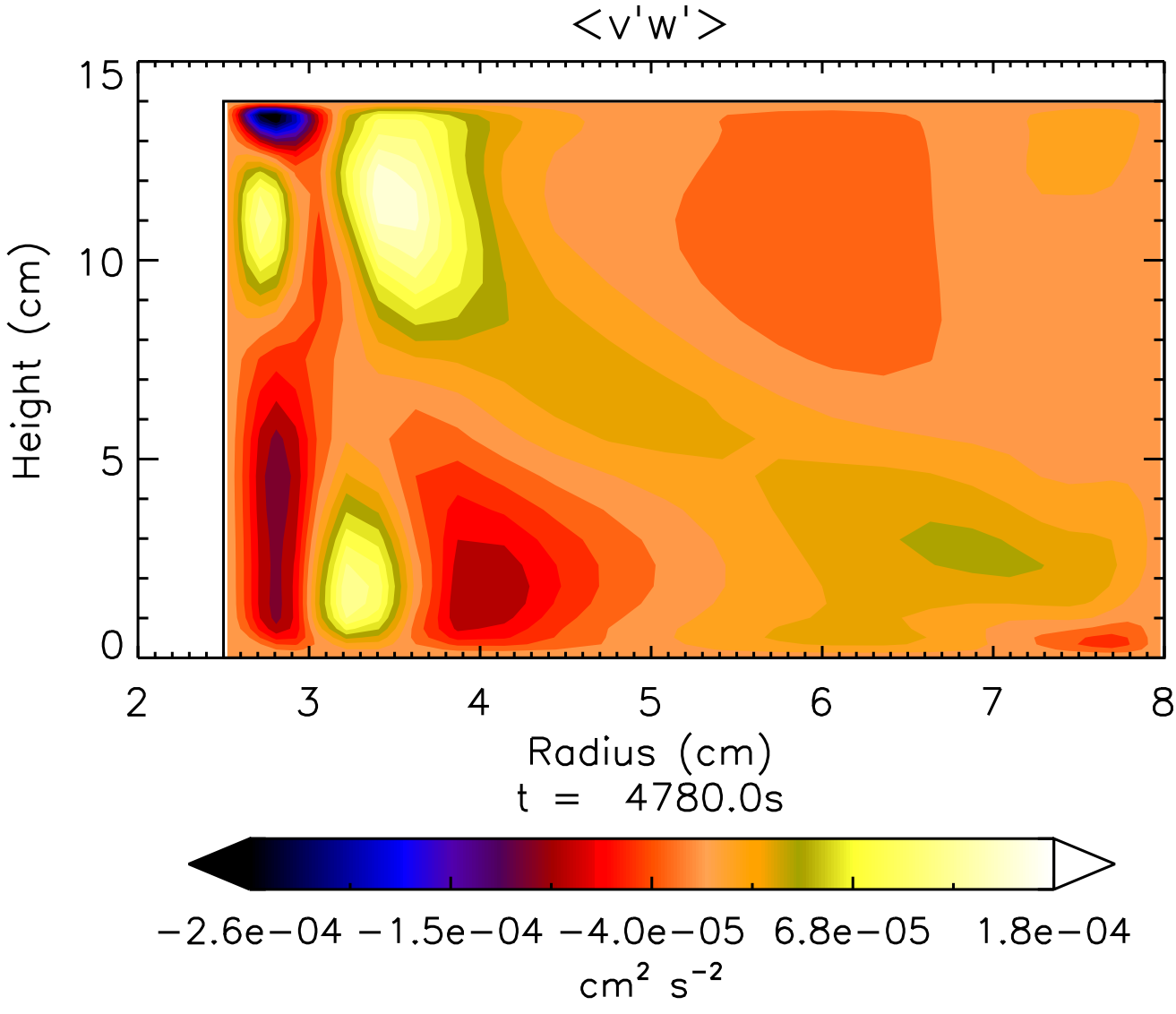

<w>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−0.2682
−0.1732
−0.0781
0.0170
0.1120
cm s⁻¹

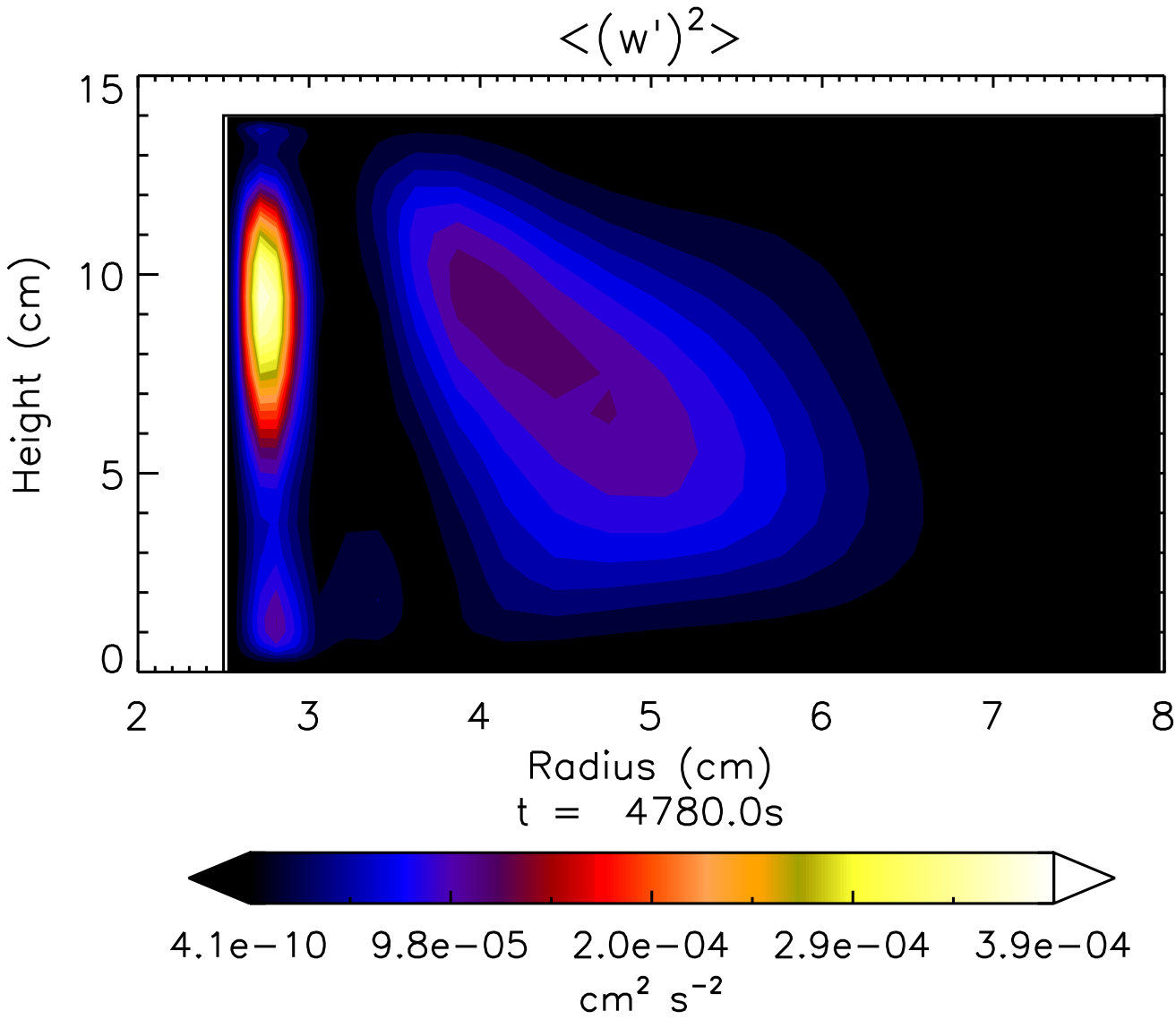

<(u')²>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
4.9e−13
1.1e−04
2.2e−04
3.3e−04
4.4e−04
cm² s⁻²

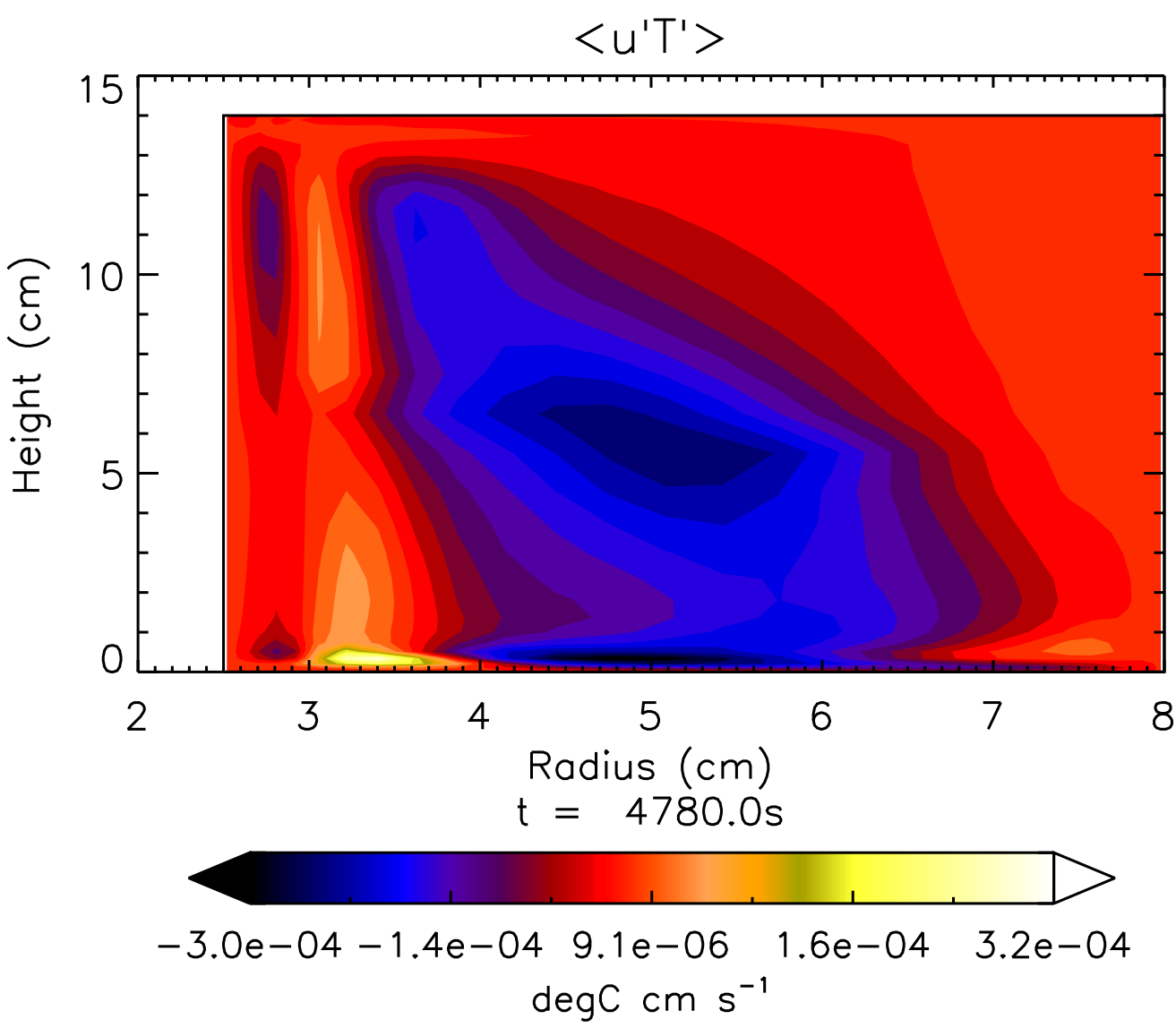

<u'v'>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−2.6e−04 −1.4e−04 −7.5e−06 1.2e−04 2.5e−04
cm² s⁻²7

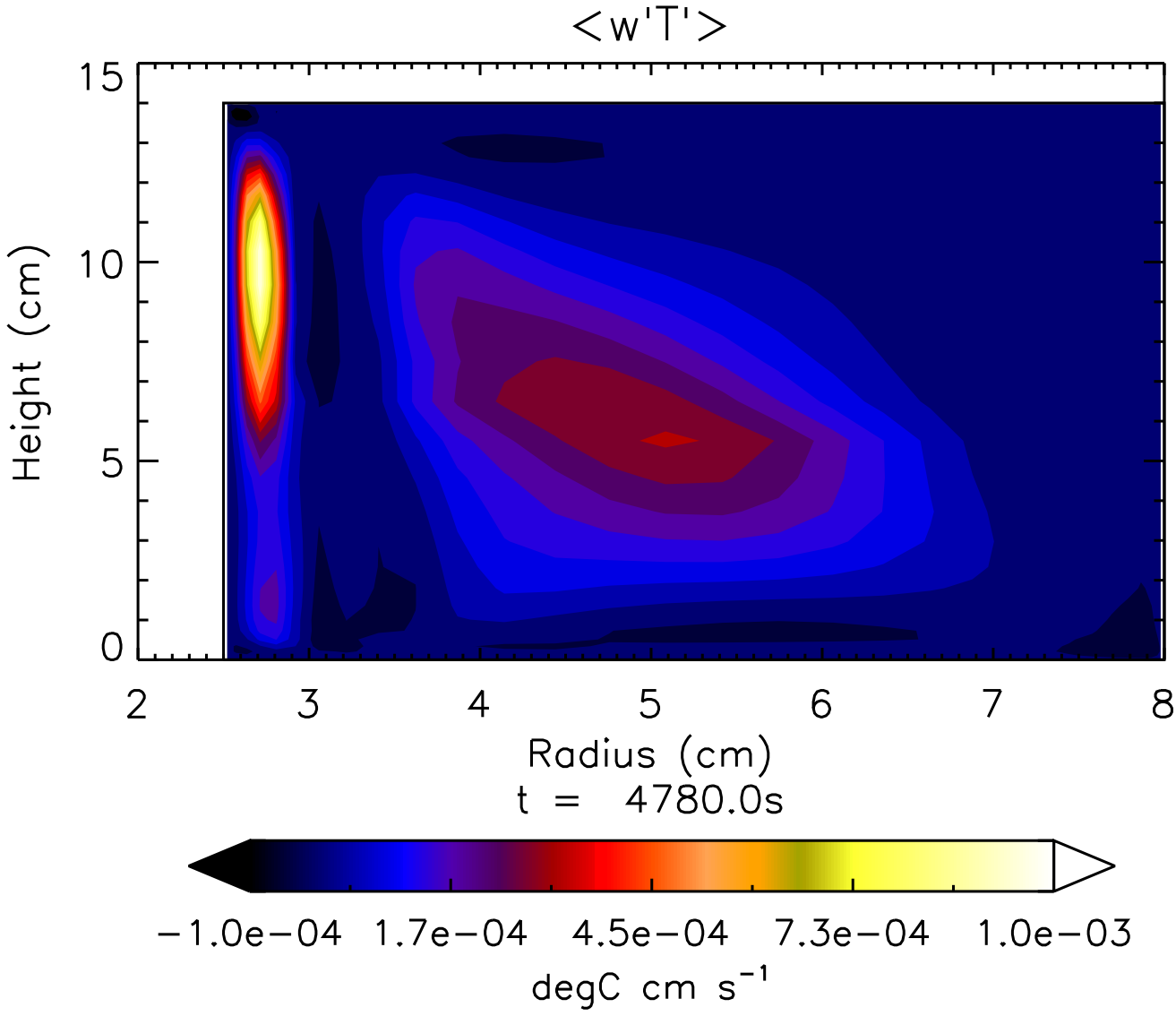

<u'w'>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.4e−04 −9.8e−05 −5.4e−05 −1.1e−05 3.3e−05
cm² s⁻²

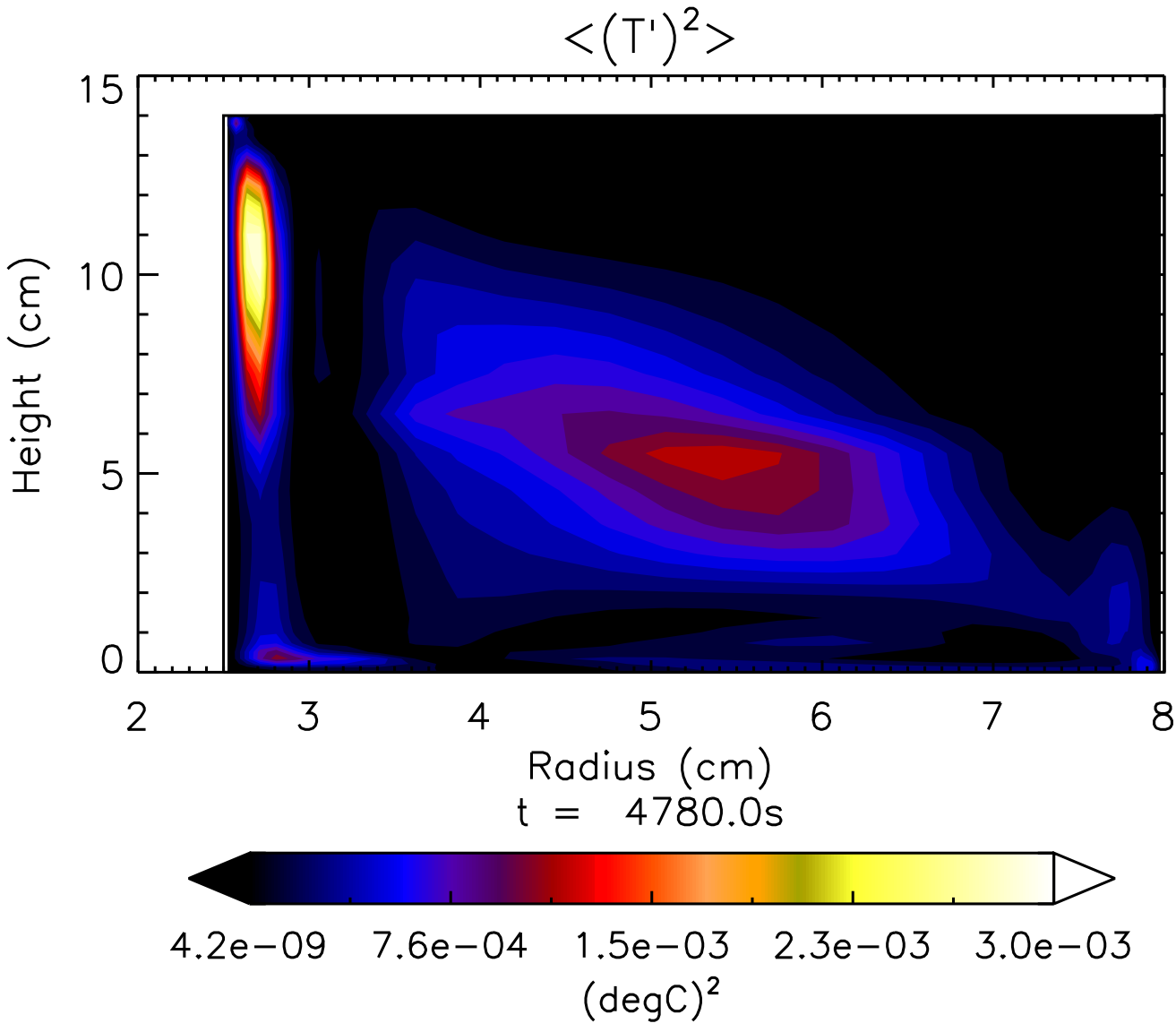

<(v')^2>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
2.0e−08
5.0e−04
1.0e−03
1.5e−03
2.0e−03
cm² s⁻²

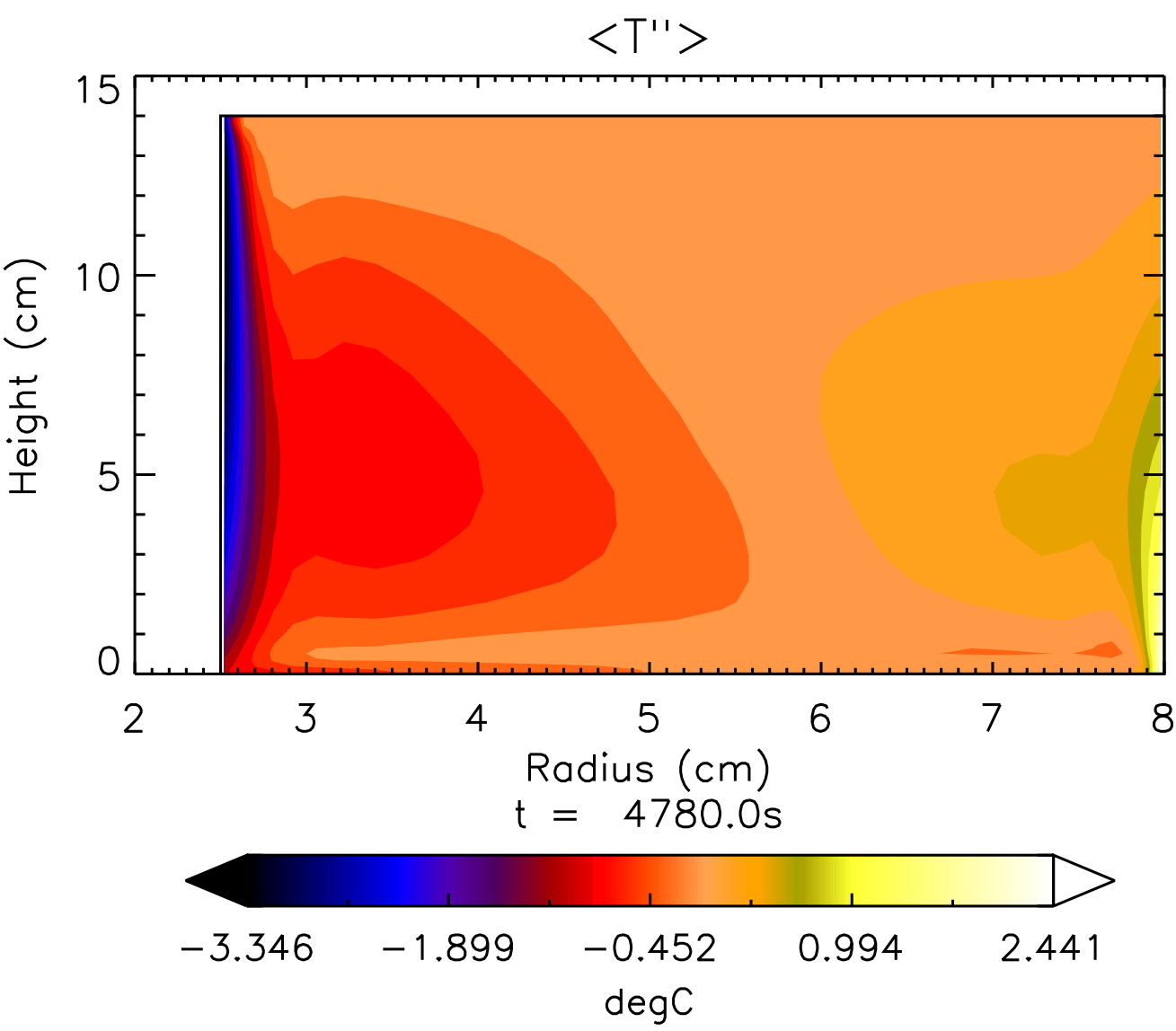

<v'w'>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−2.6e−04 −1.5e−04 −4.0e−05 6.8e−05 1.8e−04
cm² s⁻²

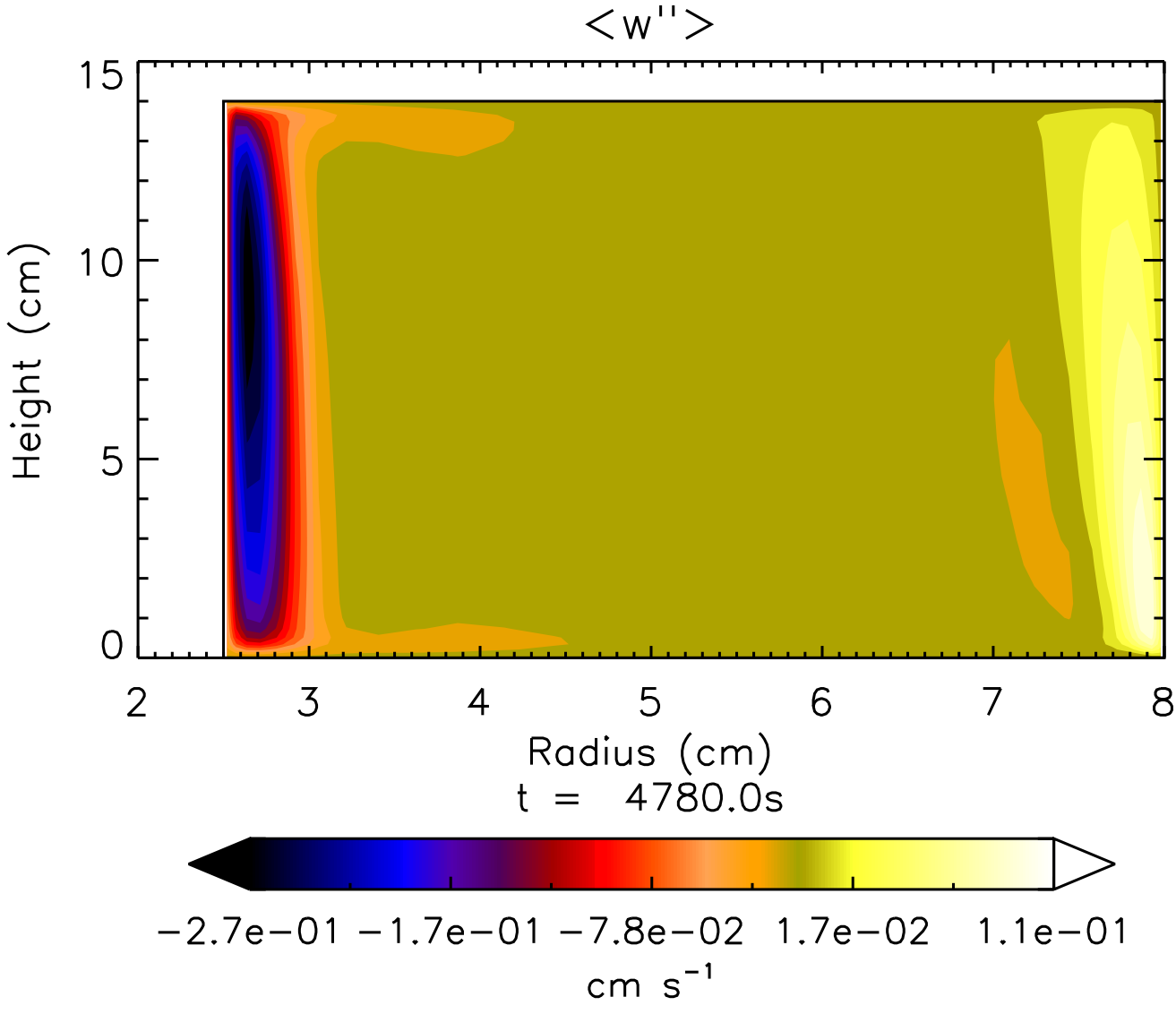

<(w')^2>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
4.1e−10
9.8e−05
2.0e−04
2.9e−04
3.9e−04
cm² s⁻²

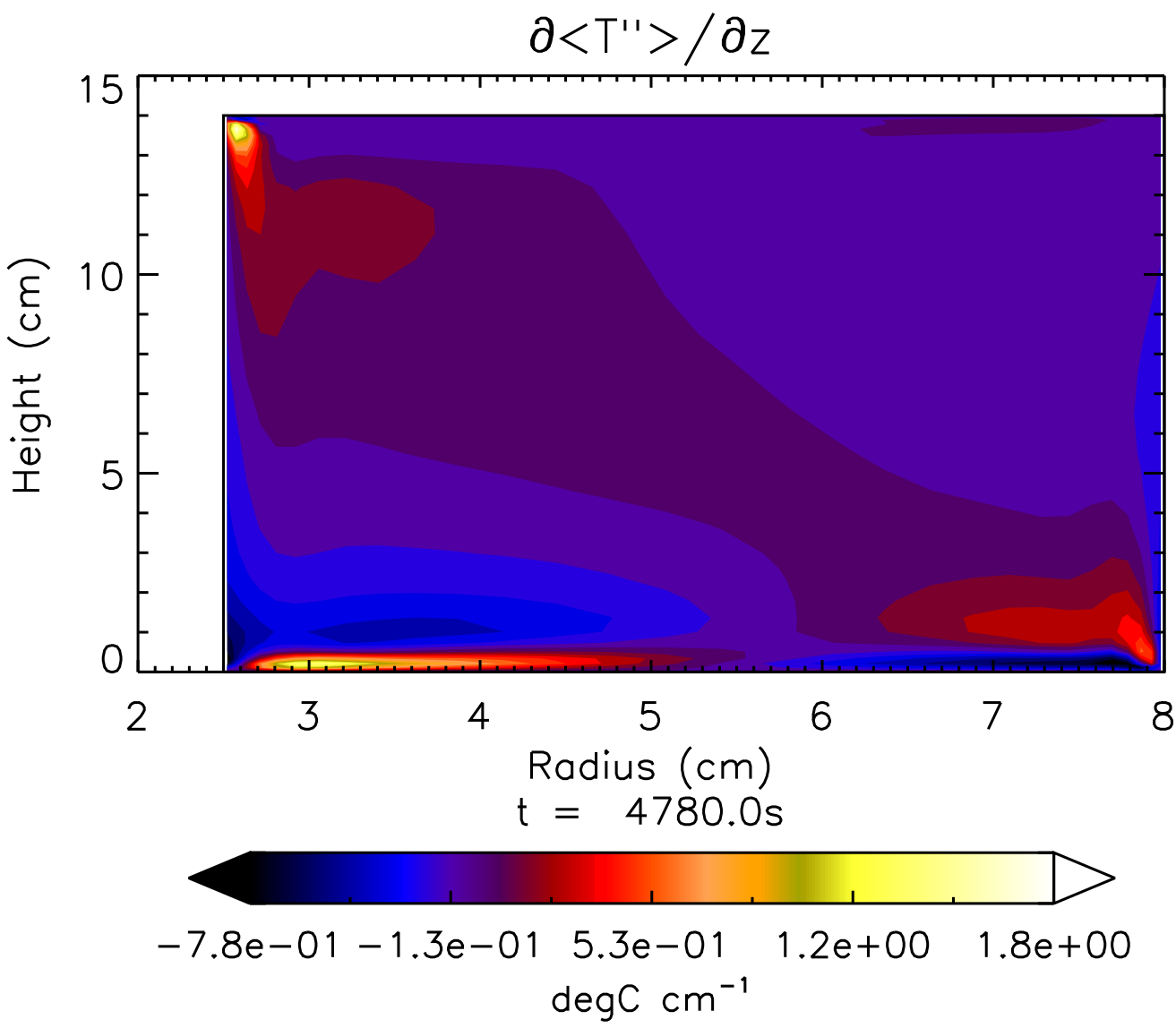

<u'T'>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−3.0e−04 −1.4e−04 9.1e−06 1.6e−04 3.2e−04
degC cm s^{-1}

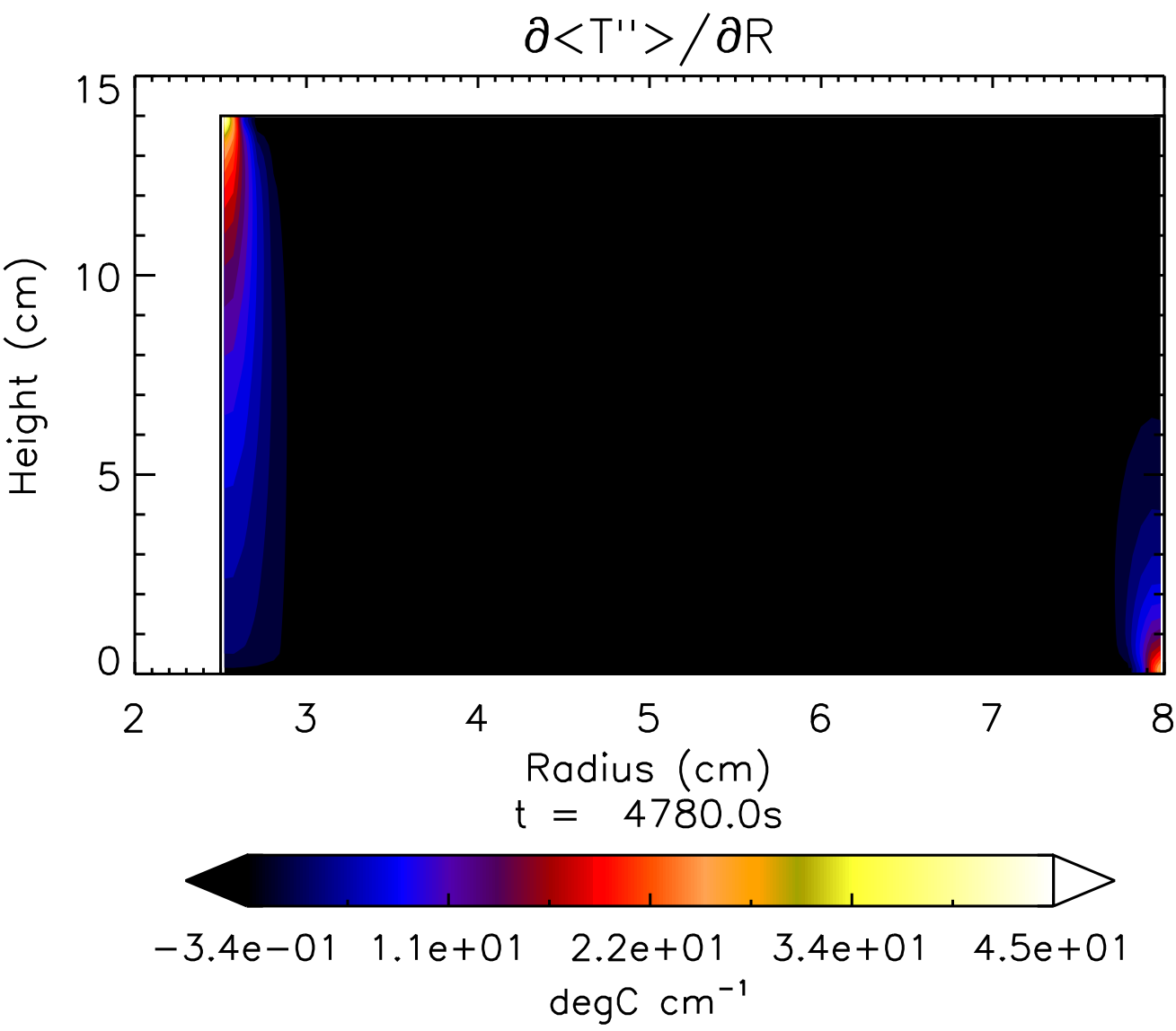

<w'T'>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.0e−04
1.7e−04
4.5e−04
7.3e−04
1.0e−03
degC cm s^{-1}

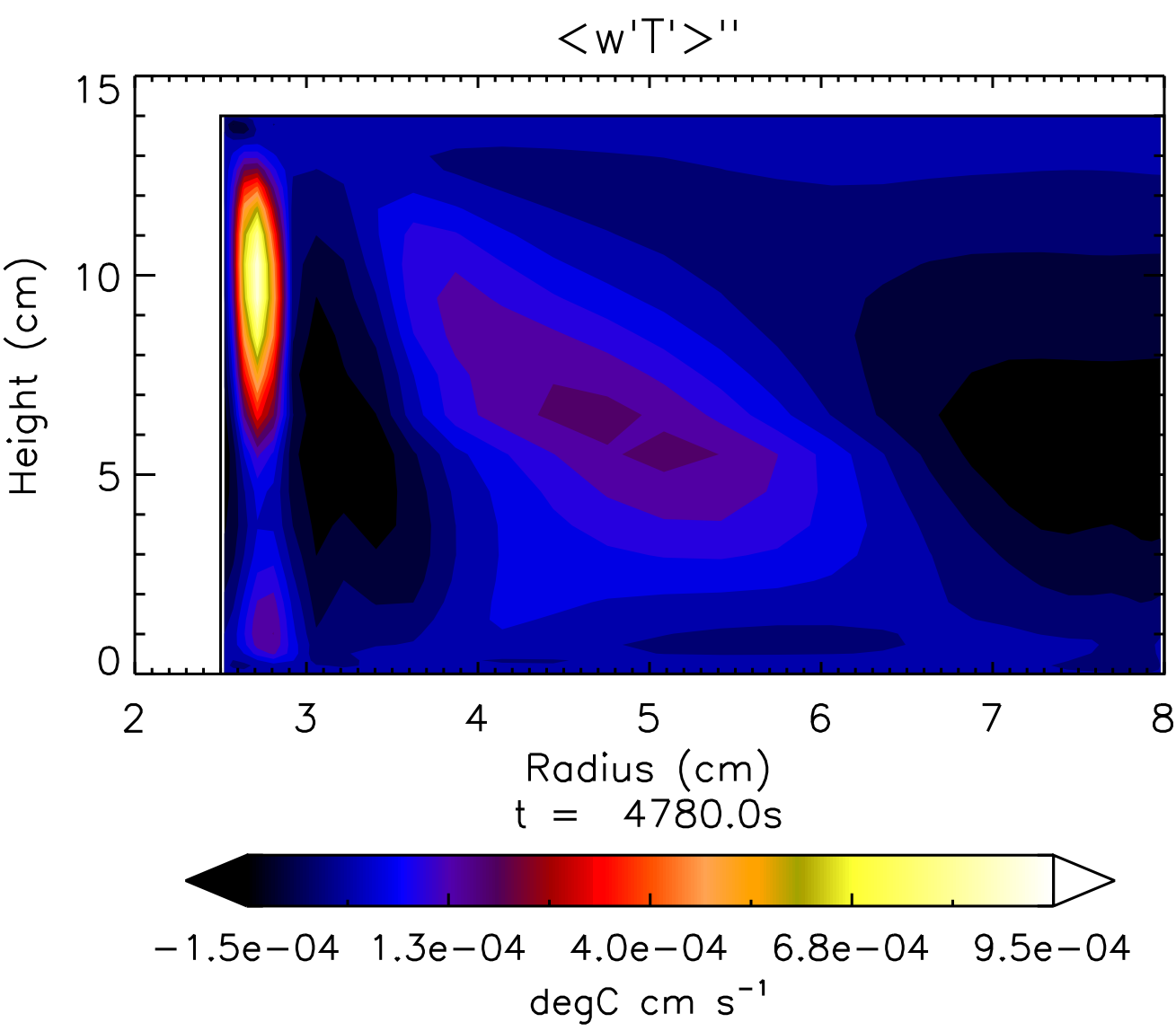

<(T')²>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
4.2e−09
7.6e−04
1.5e−03
2.3e−03
3.0e−03
(degC)²

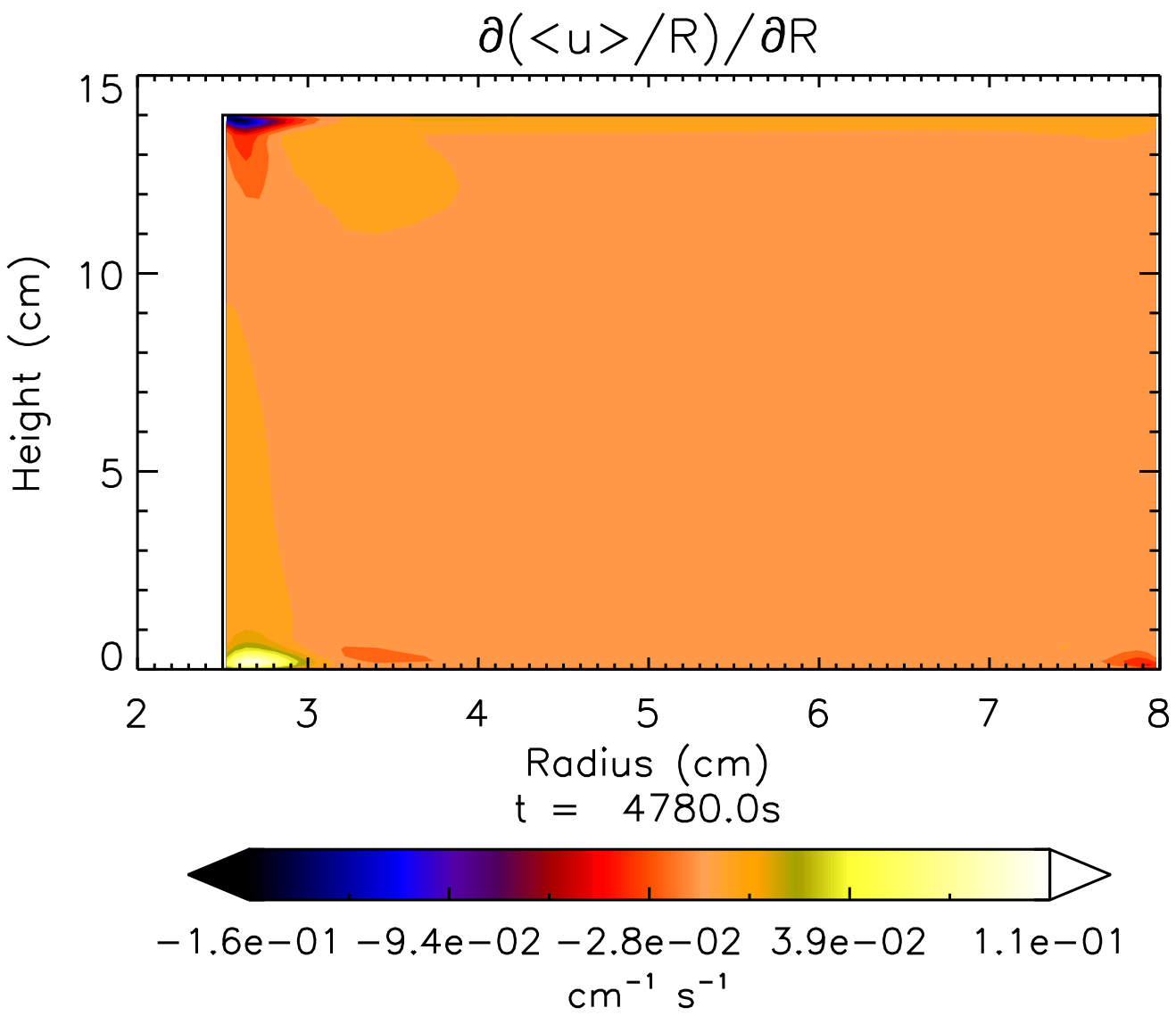

<T''>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−3.346
−1.899
−0.452
0.994
2.441
degC

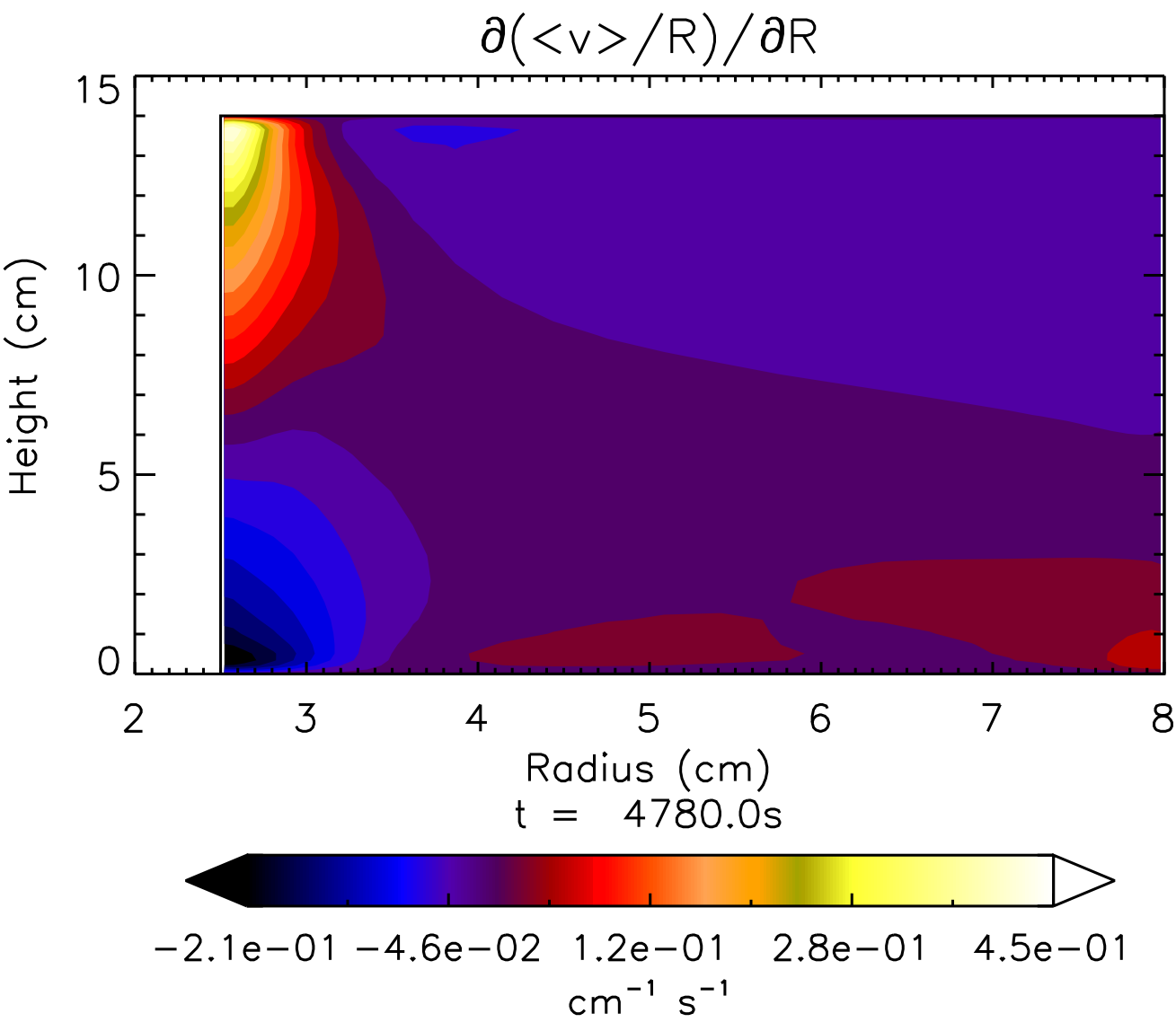

<w''>
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−2.7e−01 −1.7e−01 −7.8e−02 1.7e−02 1.1e−01
cm s^{-1}

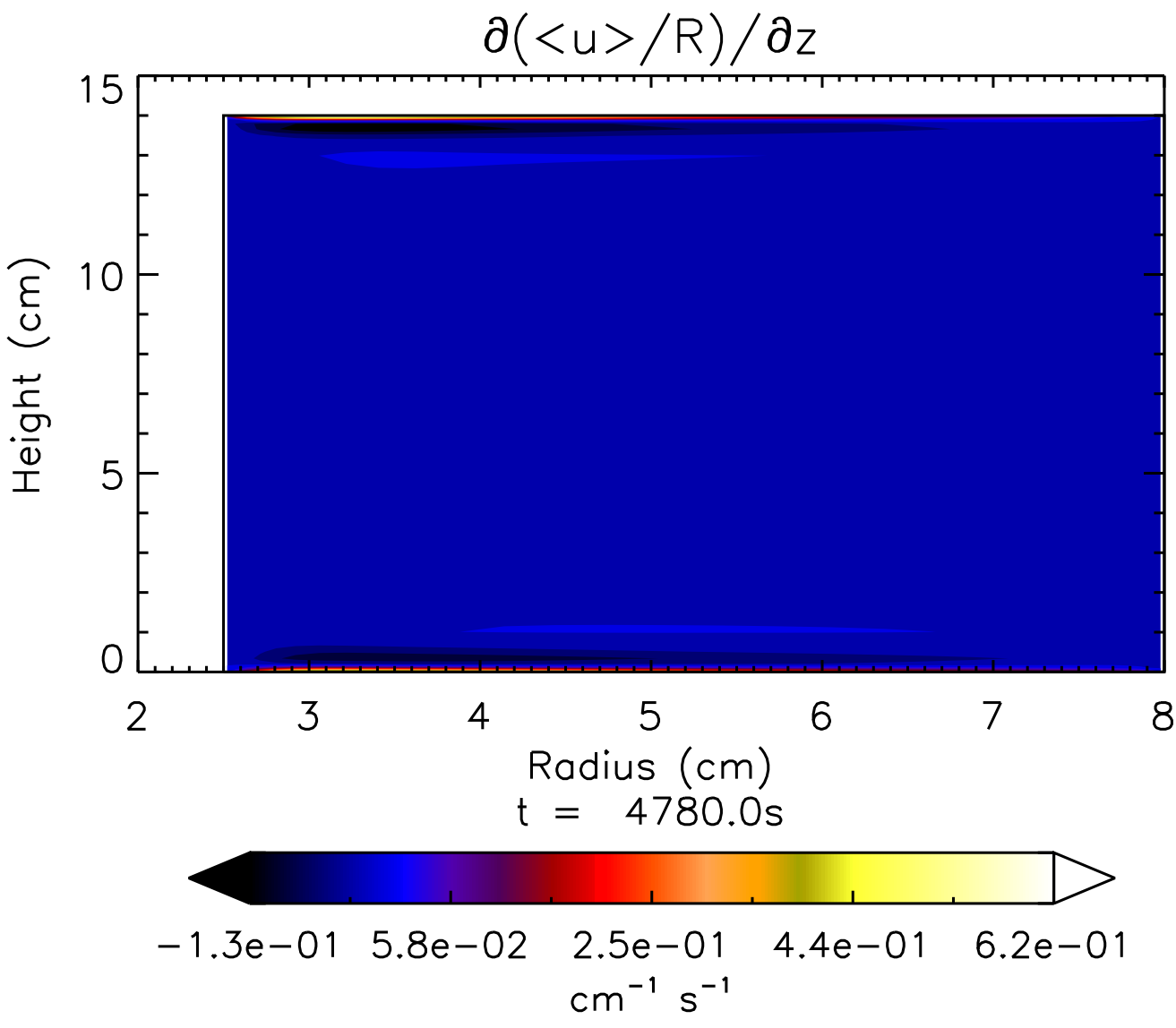

∂<T''>/∂z
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−7.8e−01 −1.3e−01 5.3e−01 1.2e+00 1.8e+00
degC cm⁻¹

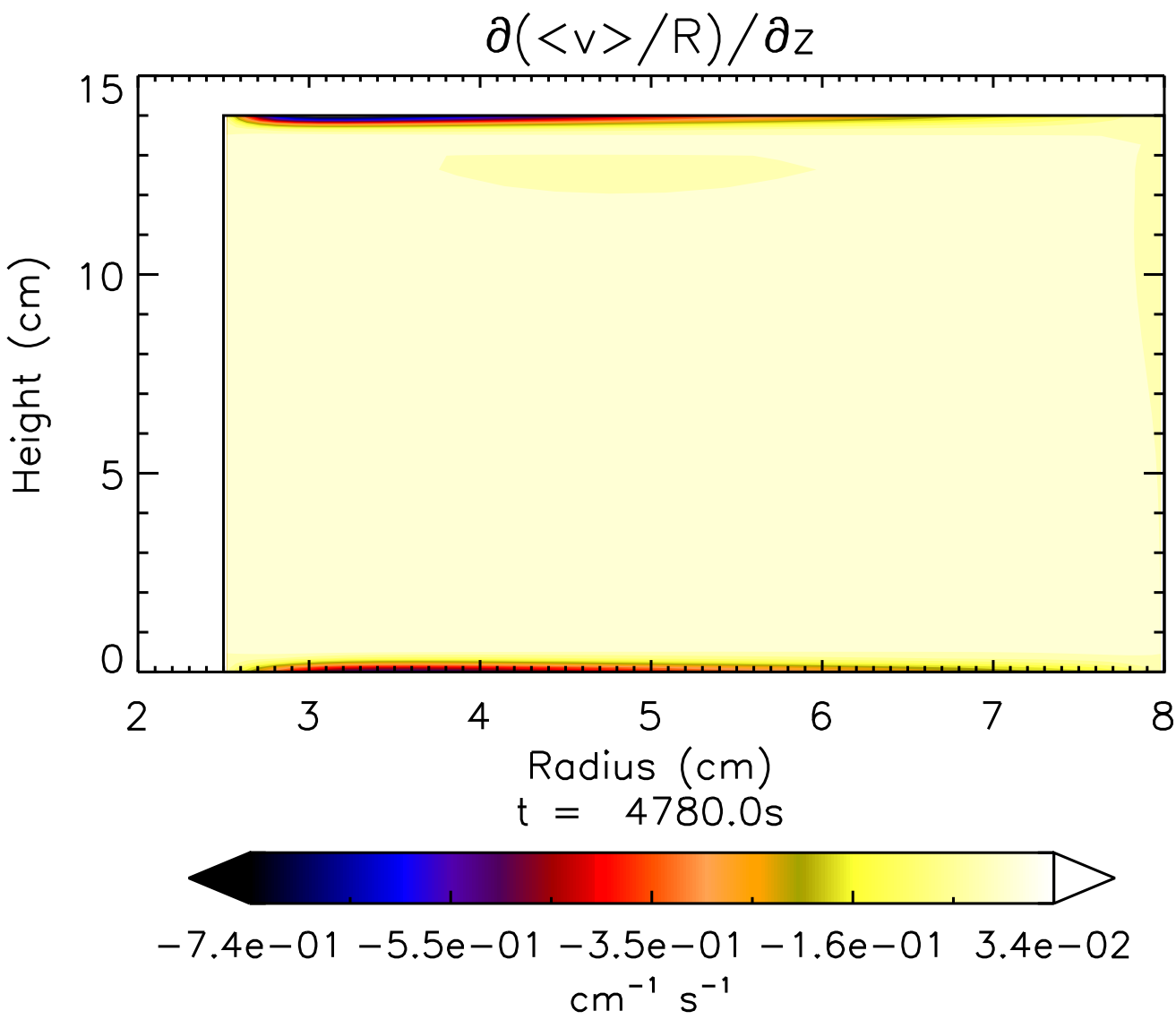

∂<T''>/∂R
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−3.4e−01
1.1e+01
2.2e+01
3.4e+01
4.5e+01
degC cm⁻¹

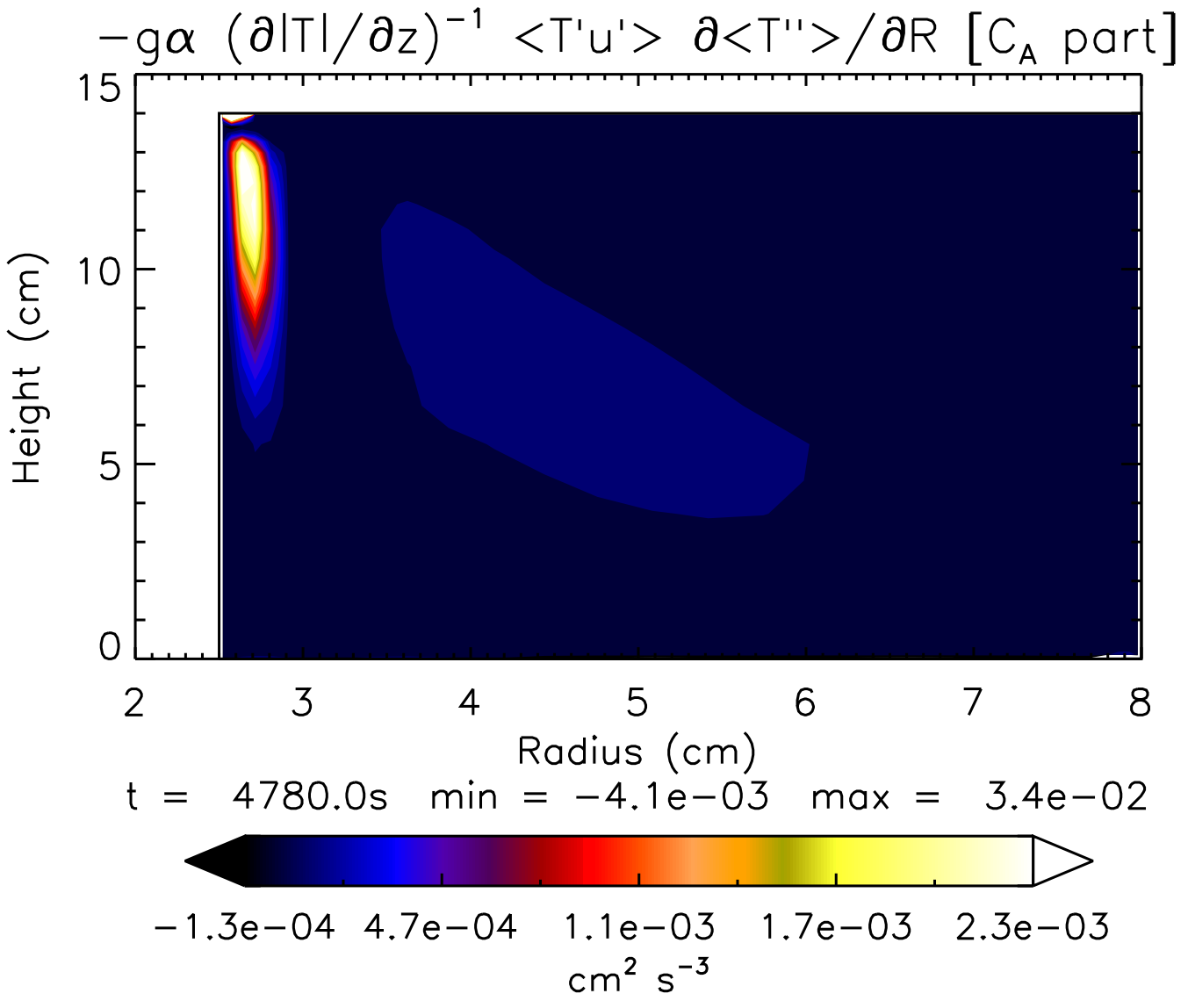

<w'T'>''
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.5e−04
1.3e−04
4.0e−04
6.8e−04
9.5e−04
degC cm s^{-1}

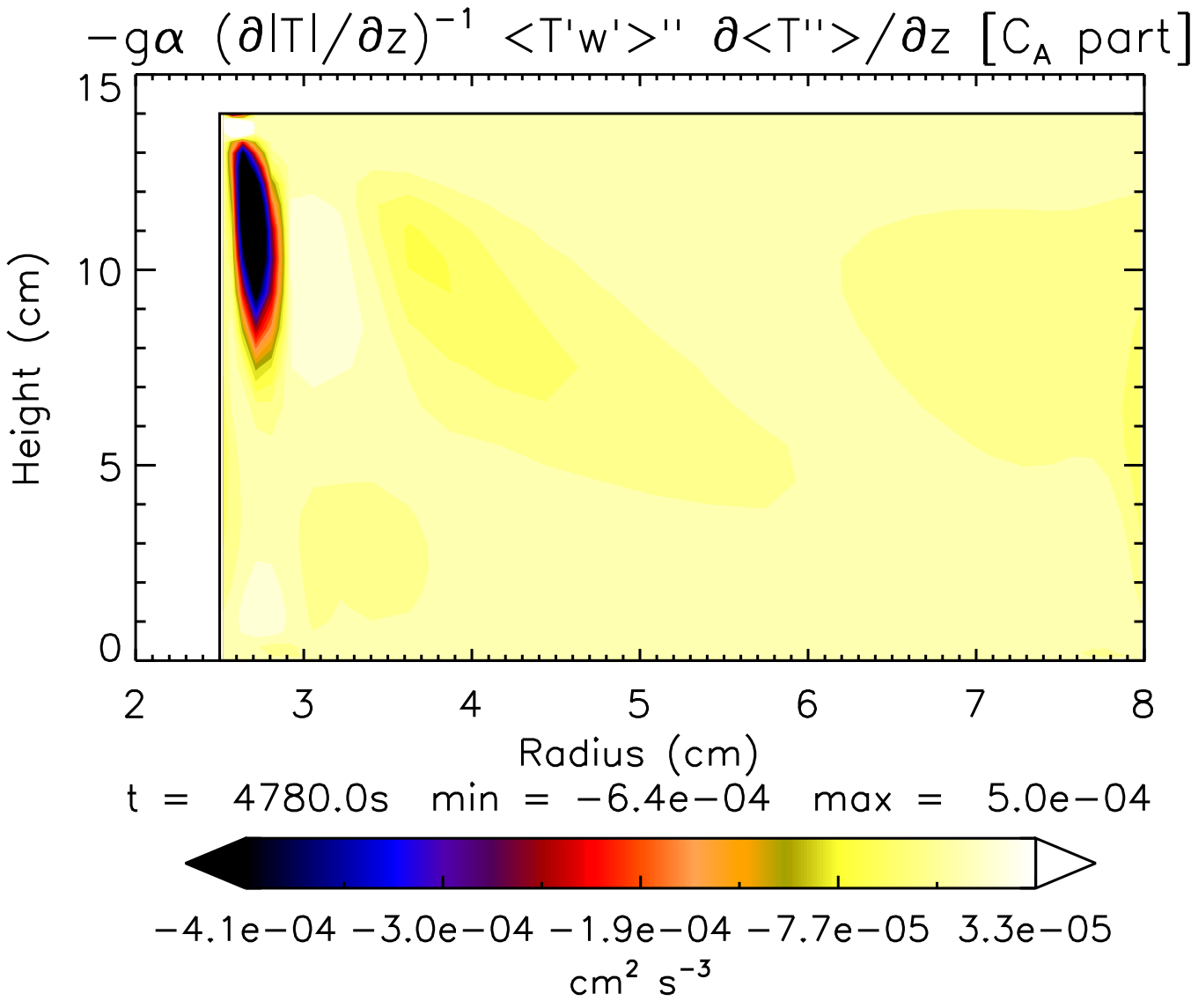

∂(<u>/R)/∂R
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.6e−01 −9.4e−02 −2.8e−02 3.9e−02 1.1e−01
cm⁻¹ s⁻¹

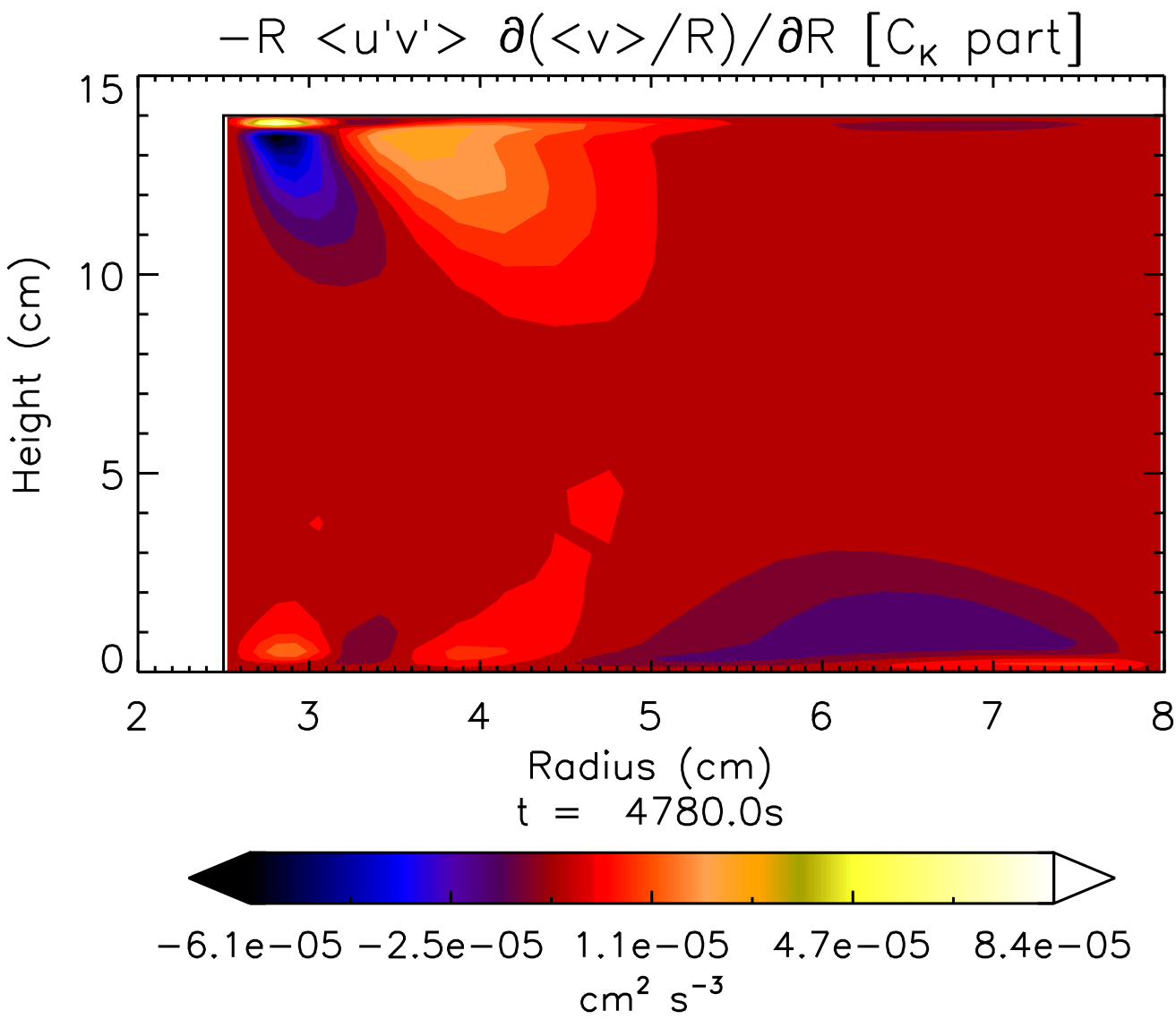

∂(<v>/R)/∂R
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−2.1e−01 −4.6e−02 1.2e−01 2.8e−01 4.5e−01
cm⁻¹ s⁻¹

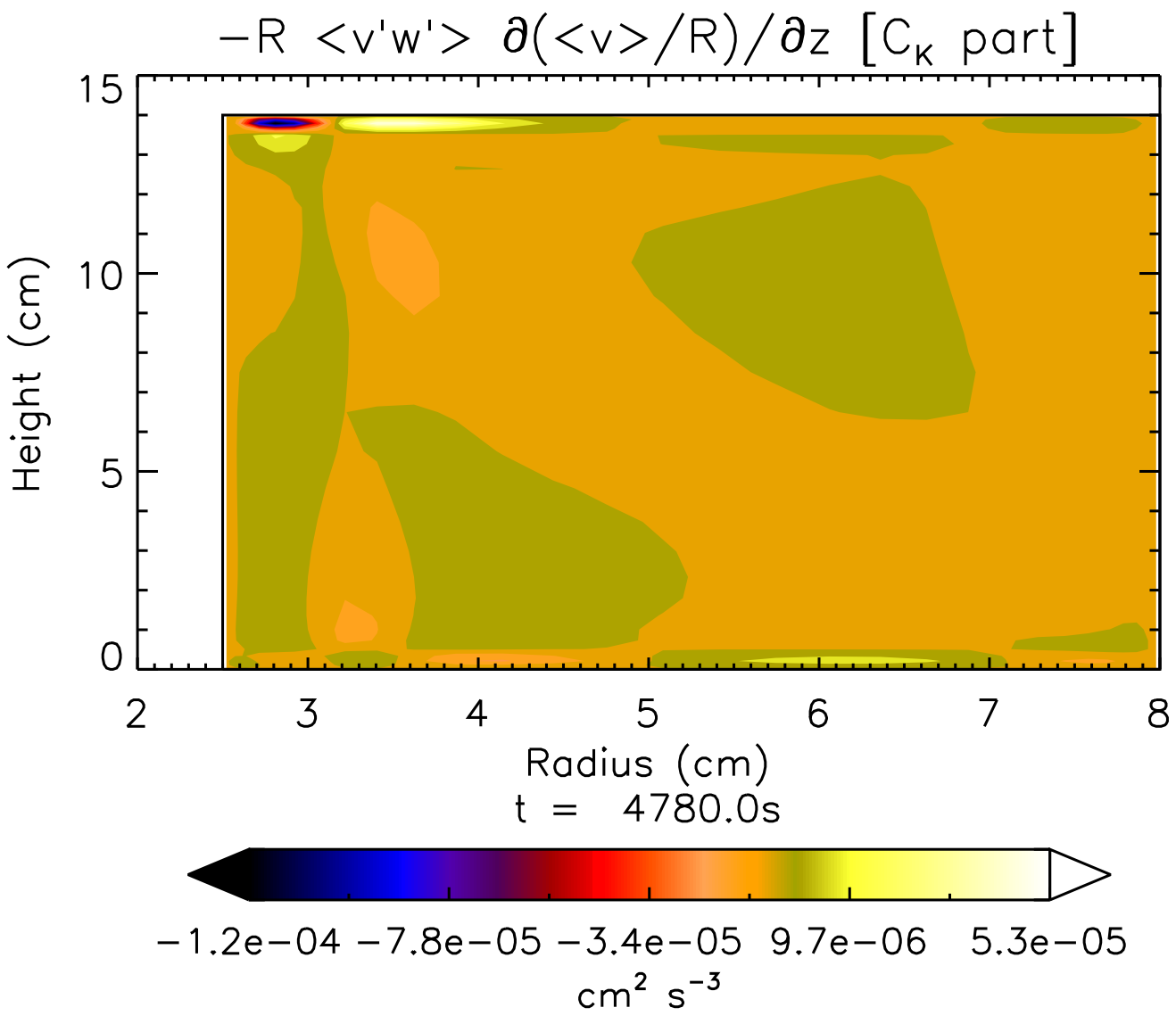

∂(<u>/R)/∂z
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.3e−01
5.8e−02
2.5e−01
4.4e−01
6.2e−01
cm⁻¹ s⁻¹

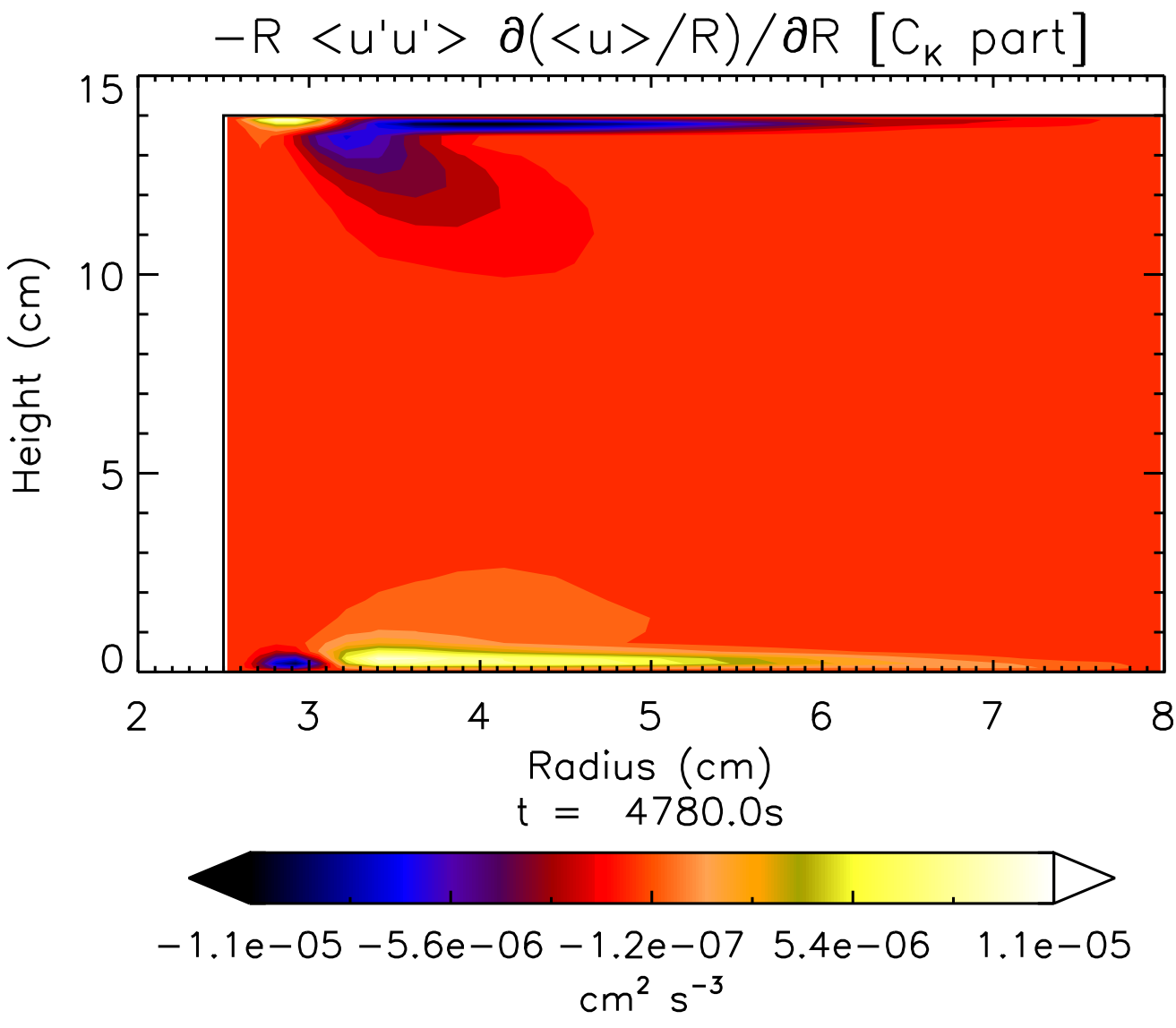

∂(<v>/R)/∂z
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−7.4e−01 −5.5e−01 −3.5e−01 −1.6e−01 3.4e−02
cm⁻¹ s⁻¹

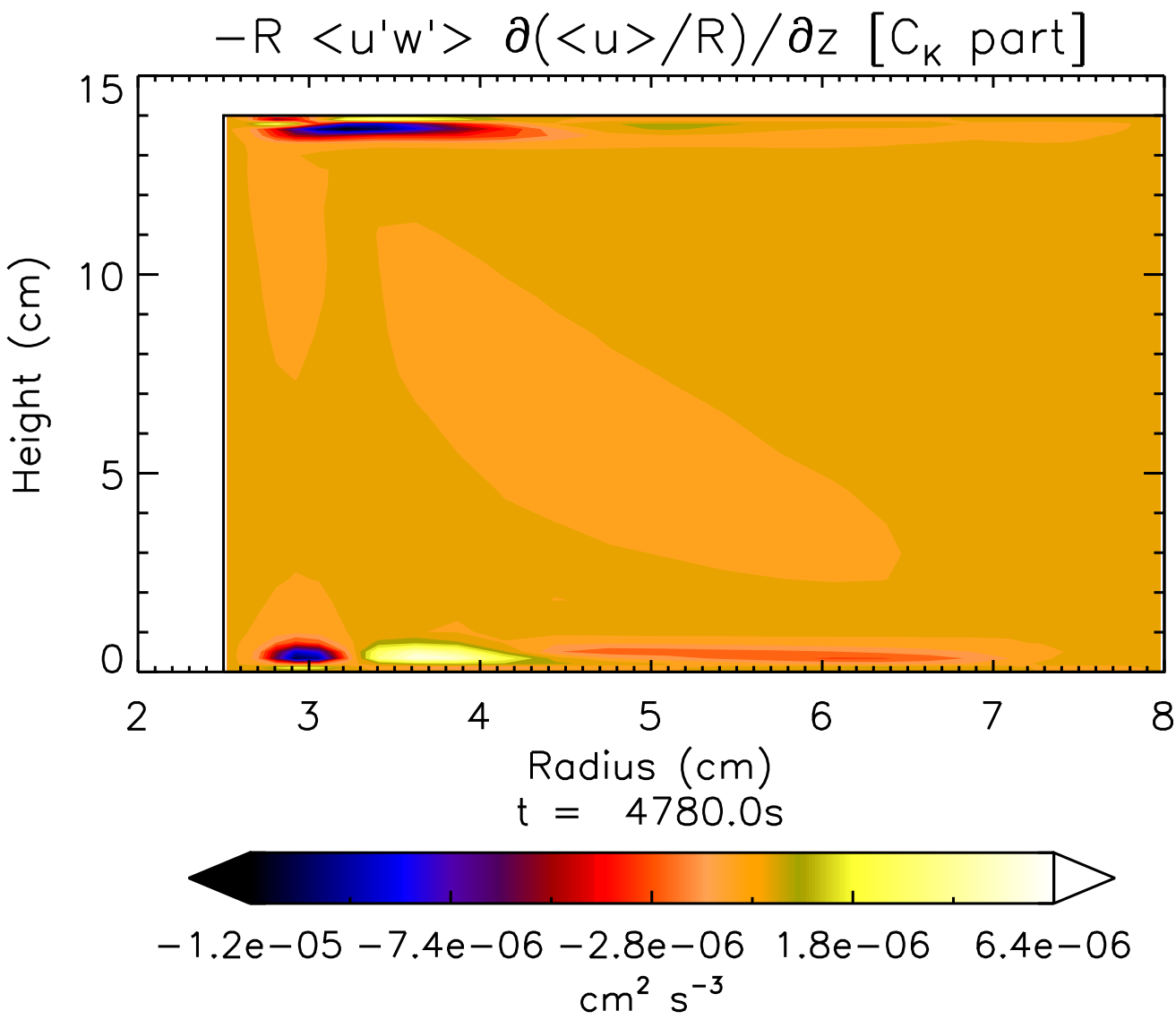

−gα (∂|T|/∂z)^−1 <T'u'> ∂<T''>/∂R [C_A part]
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s min = −4.1e−03 max = 3.4e−02
−1.3e−04
4.7e−04
1.1e−03
1.7e−03
2.3e−03
cm² s⁻³

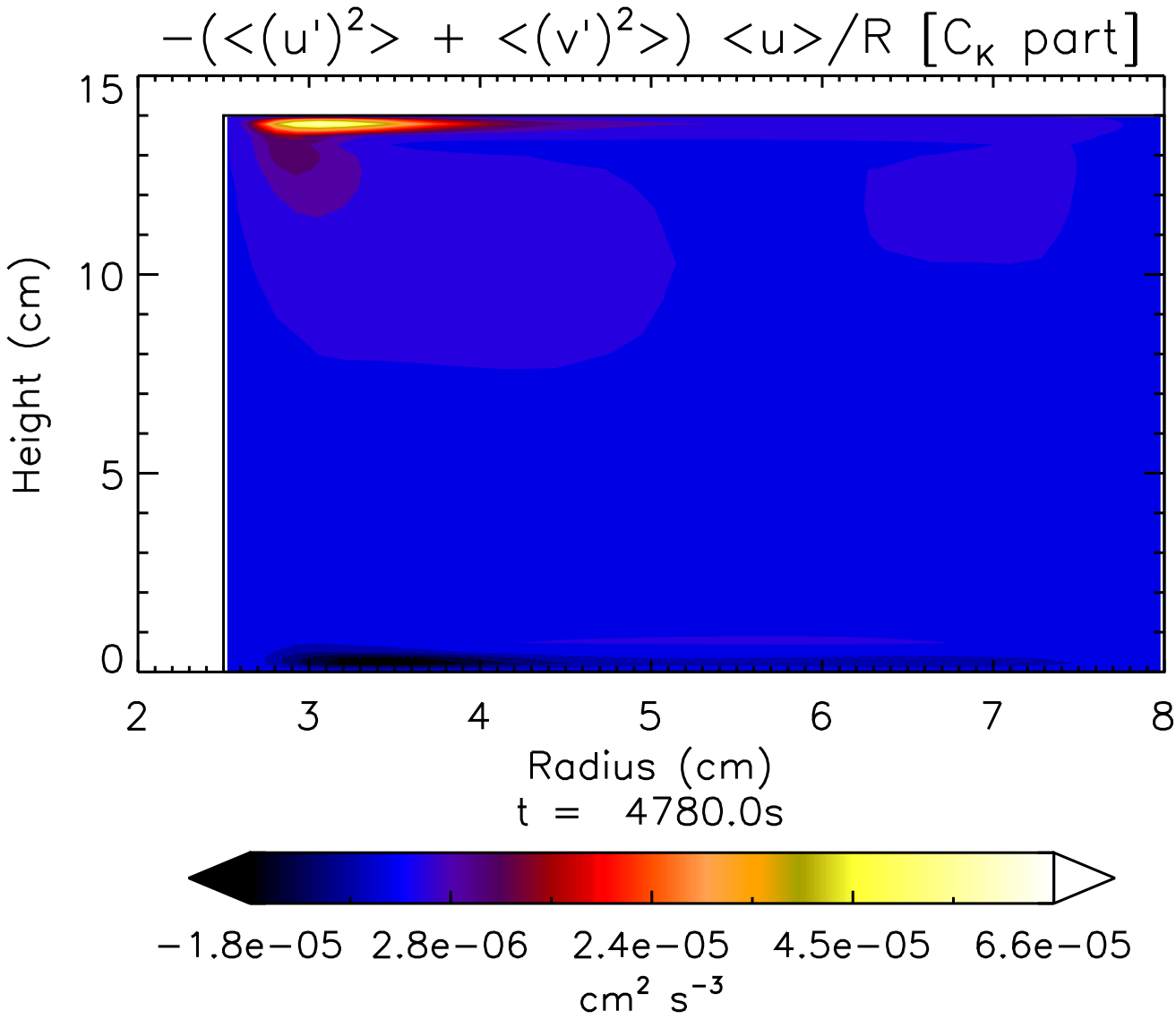

−gα (∂|T|/∂z)^−1 <T'w'>'' ∂<T''>/∂z [C_A part]
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s min = −6.4e−04 max = 5.0e−04
−4.1e−04 −3.0e−04 −1.9e−04 −7.7e−05 3.3e−05
cm² s⁻³

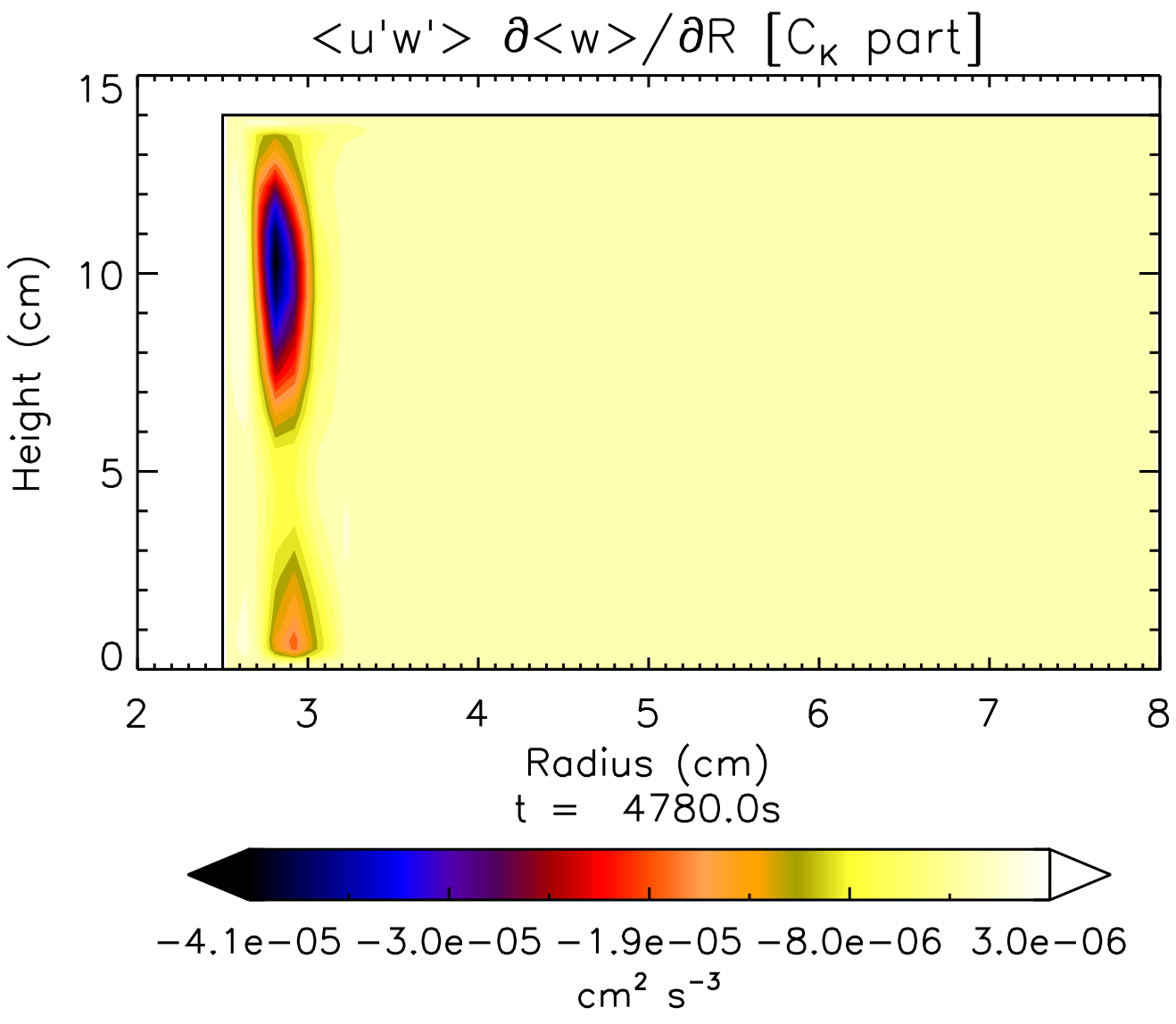

−R <u'v'> ∂(<v>/R)/∂R [C_K part]
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−6.1e−05 −2.5e−05 1.1e−05 4.7e−05 8.4e−05
cm² s⁻³

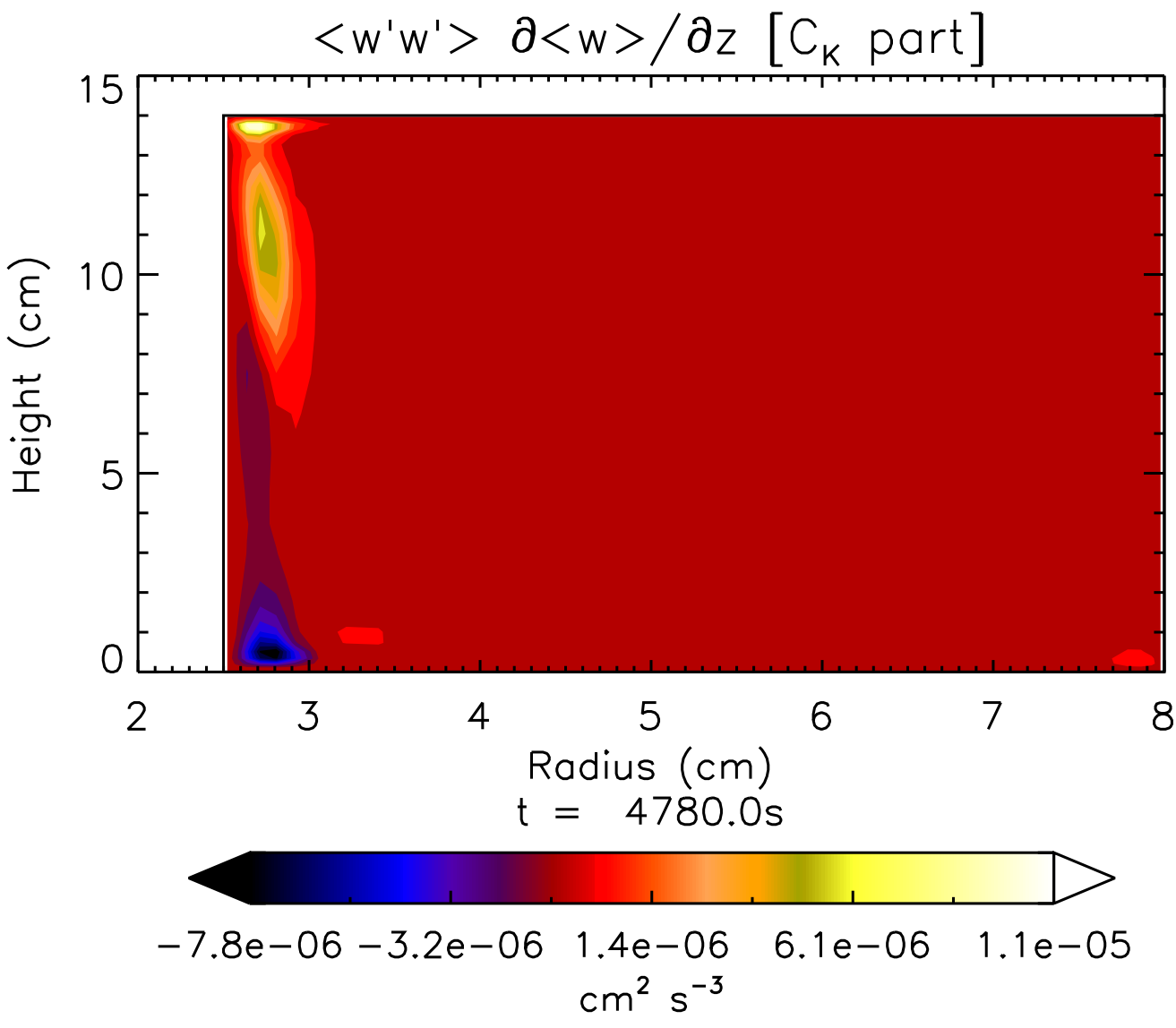

−R <v'w'> ∂(<v>/R)/∂z [C_K part]
Height (cm)
0
5
10
15
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.2e−04 −7.8e−05 −3.4e−05 9.7e−06 5.3e−05
cm² s⁻³

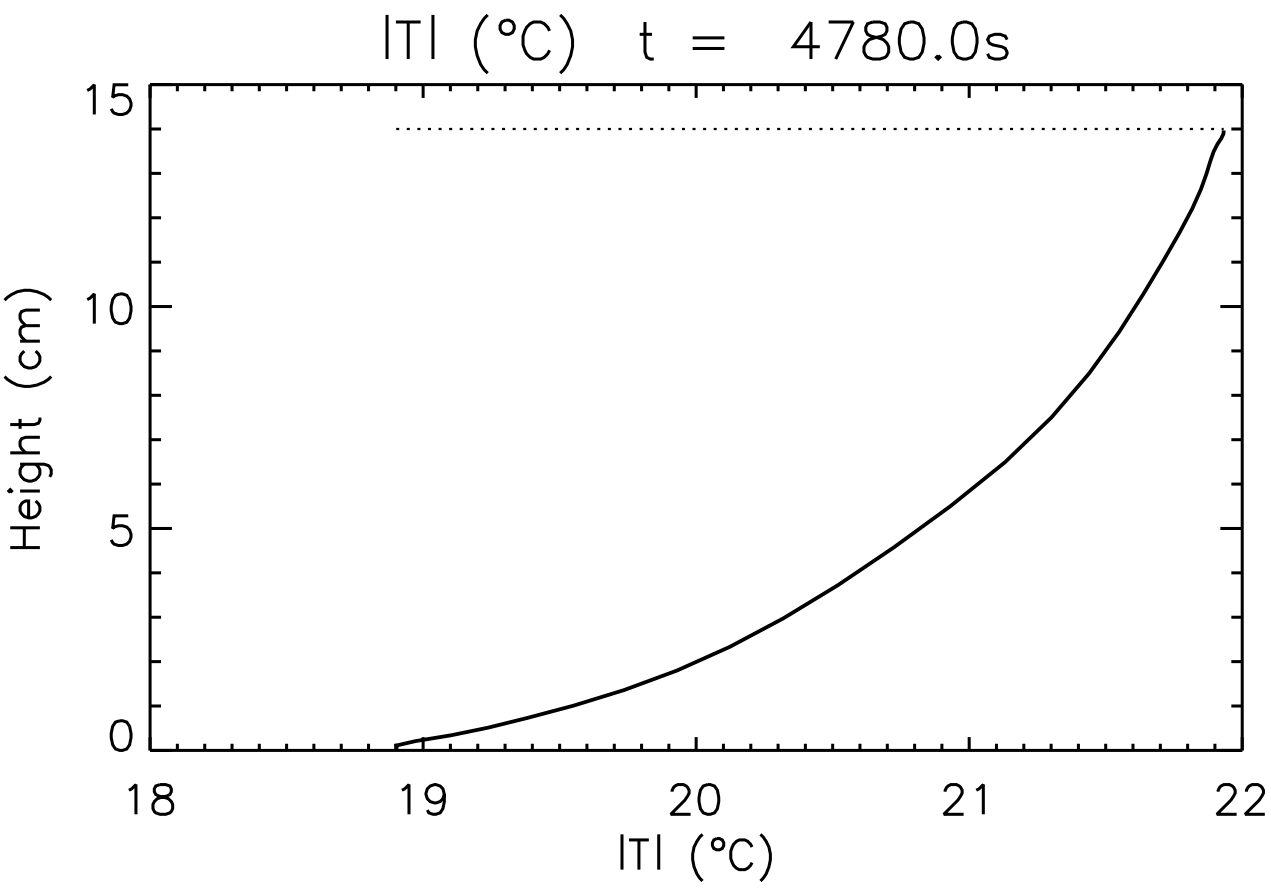

−R <u'u'> ∂(<u>/R)/∂R [C_K part]
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.1e−05 −5.6e−06 −1.2e−07 5.4e−06 1.1e−05
cm² s⁻³

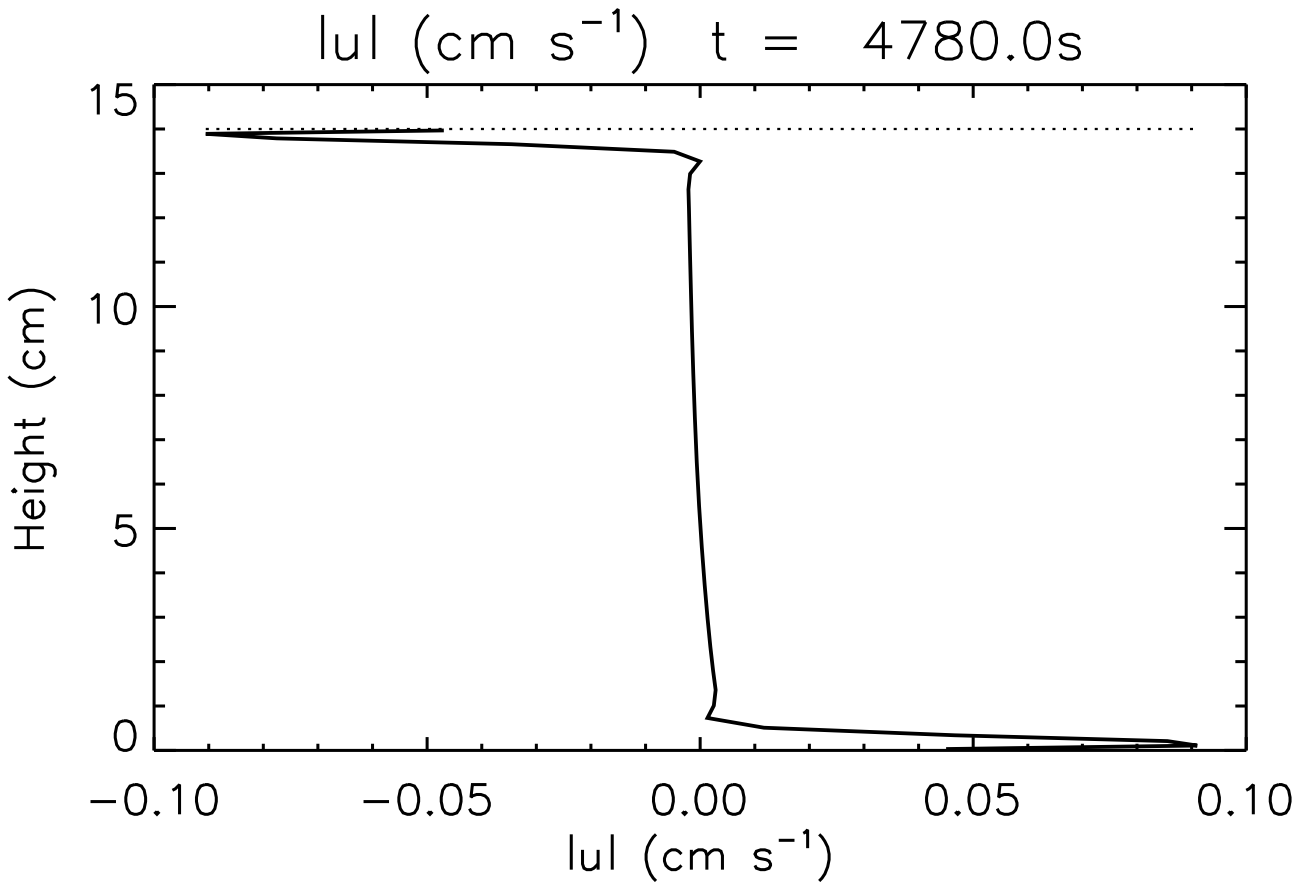

−R <u'w'> ∂(<u>/R)/∂z [C_K part]
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.2e−05 −7.4e−06 −2.8e−06 1.8e−06 6.4e−06
cm² s⁻³

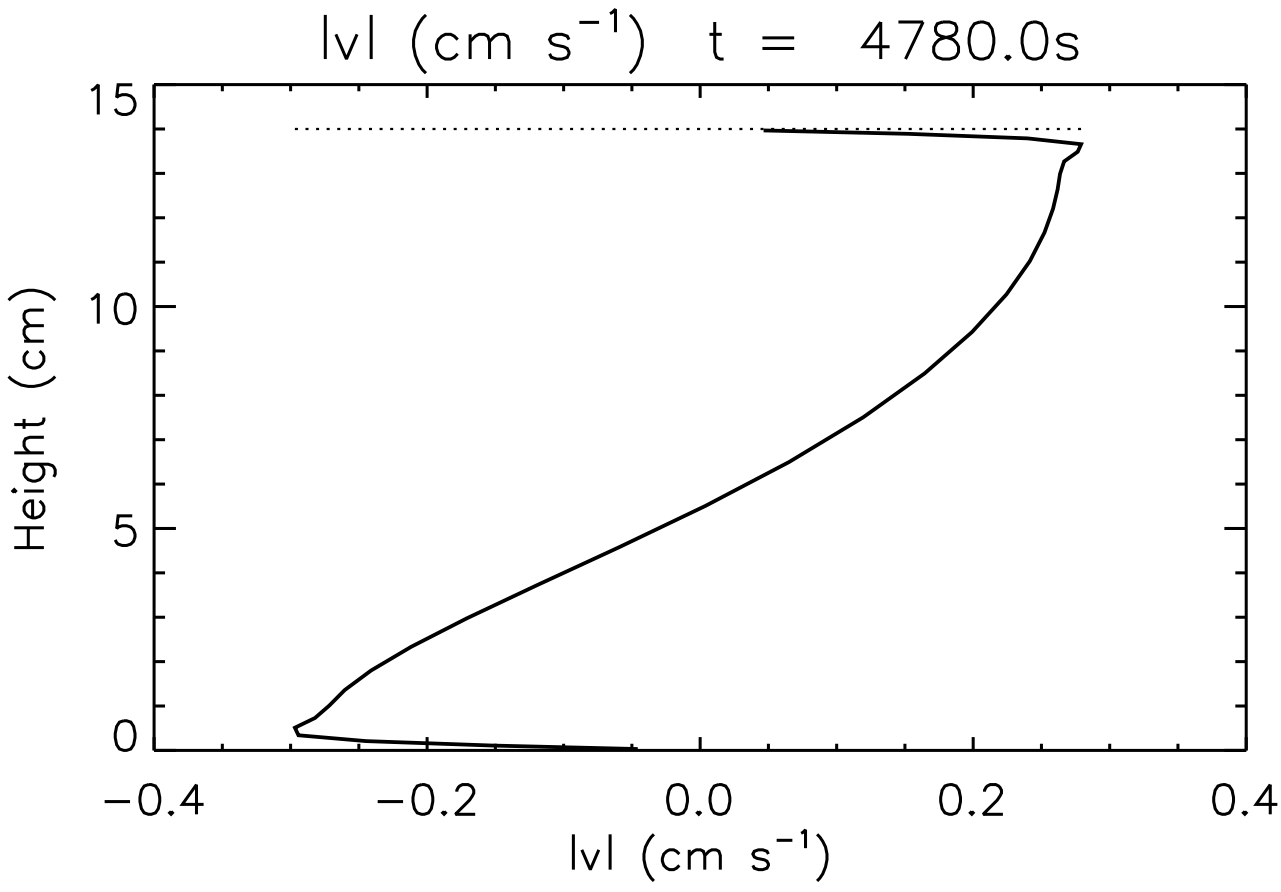

−(<(u')²> + <(v')²>) <u>/R [C_K part]
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−1.8e−05
2.8e−06
2.4e−05
4.5e−05
6.6e−05
cm² s⁻³

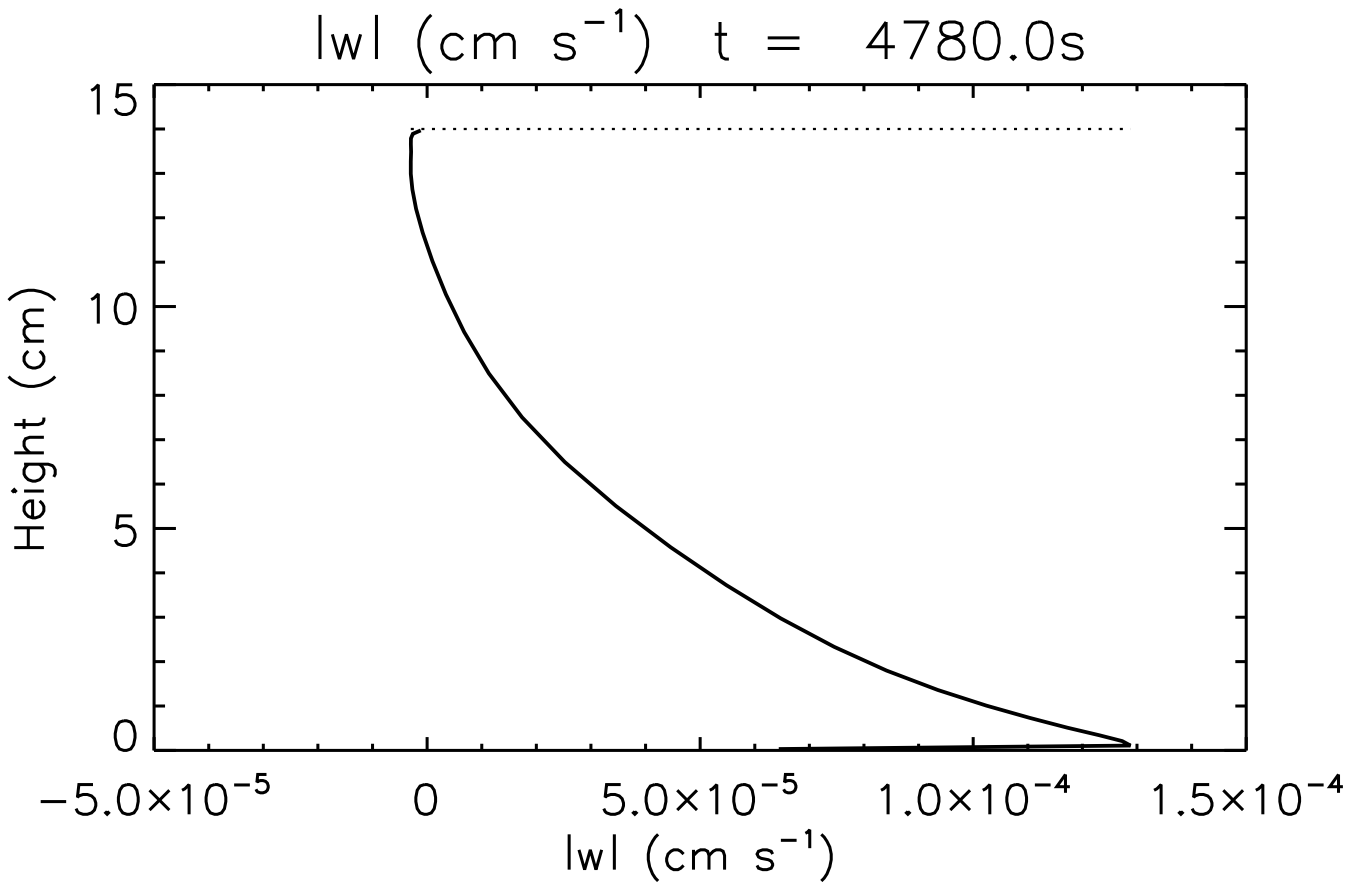

<u'w'> ∂<w>/∂R [C_K part]
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−4.1e−05 −3.0e−05 −1.9e−05 −8.0e−06 3.0e−06
cm² s⁻³

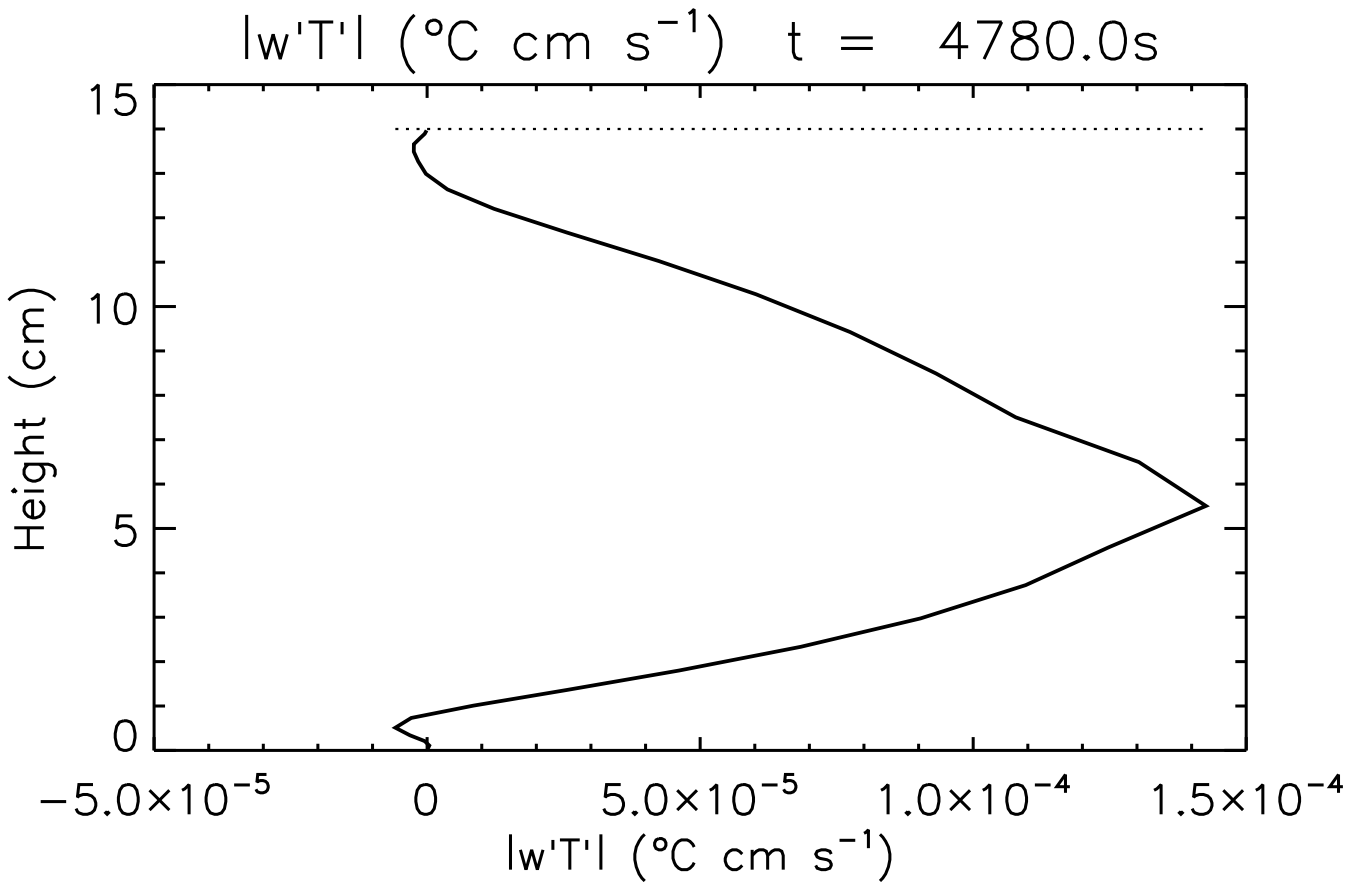

<w'w'> ∂<w>/∂z [C_K part]
15
10
5
0
Height (cm)
2
3
4
5
6
7
8
Radius (cm)
t = 4780.0s
−7.8e−06 −3.2e−06 1.4e−06 6.1e−06 1.1e−05
cm² s⁻³

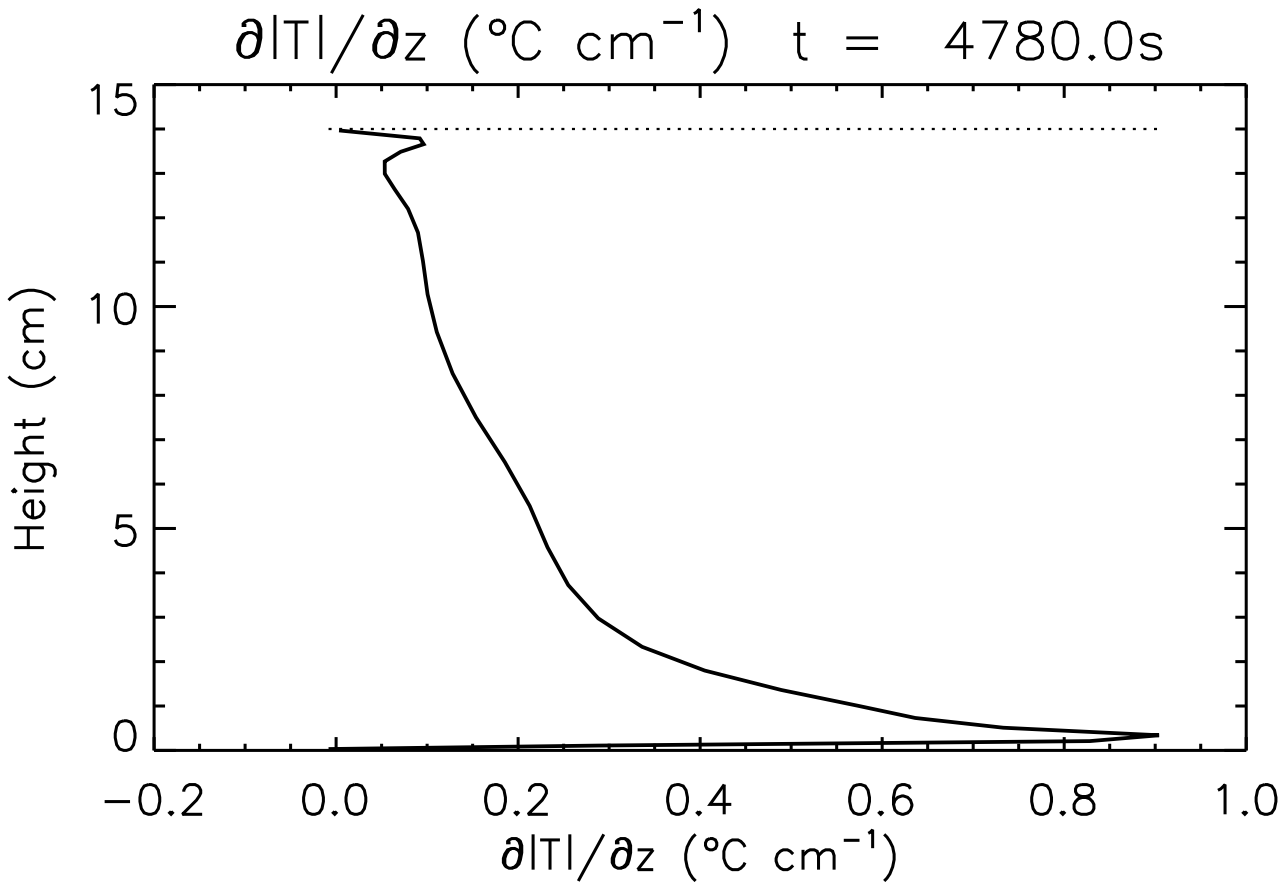

|T| (°C) t = 4780.0s
15
10
5
0
Height (cm)
18
19
20
21
22
|T| (°C)


lul (cm s^{-1}) t = 4780.0s
Height (cm)
15
10
5
0
−0.10
−0.05
0.00
0.05
0.10
lul (cm s^{-1})


|v| (cm s^{-1}) t = 4780.0s
15
10
5
0
Height (cm)
−0.4
−0.2
0.0
0.2
0.4
|v| (cm s^{-1})


|w| (cm s^{-1}) t = 4780.0s
15
10
5
0
Height (cm)
−5.0×10^{-5}
0
5.0×10^{-5}
1.0×10^{-4}
1.5×10^{-4}
|w| (cm s^{-1})


|w'T'| (°C cm s^{-1}) t = 4780.0s
Height (cm)
15
10
5
0
−5.0×10^{-5}
0
5.0×10^{-5}
1.0×10^{-4}
1.5×10^{-4}
|w'T'| (°C cm s^{-1})


∂|T|/∂z (°C cm⁻¹) t = 4780.0s
15
10
5
0
Height (cm)
−0.2
0.0
0.2
0.4
0.6
0.8
1.0
∂|T|/∂z (°C cm⁻¹)