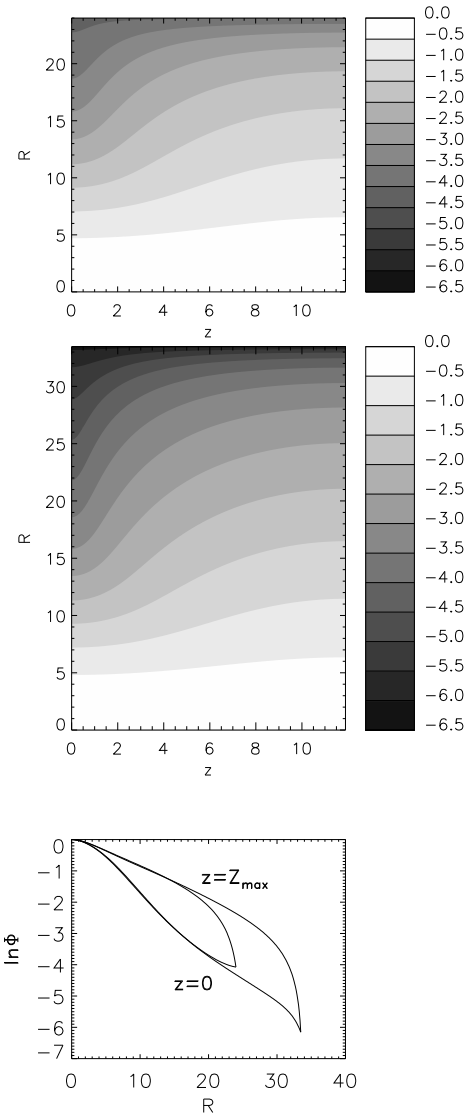

Fig. 2. Azimuthal section of the magnetic flux $\Phi(z, R)$ in the axially-symmetric final state for $\alpha = 1$ and $g_R = g =$ const, when the upper boundary is placed at $R_{\max} = 24$ (top) and at $R_{\max} = 33.5$ (middle). Magnetic field lines coincide with the isocontours of Φ. The grayscale bar is shown in a natural logarithmic scale. The unit length is c_s^2/g. A comparison of the radial profile of the magnetic flux along cuts at $z = 0$ and $z = Z_{\max}$ is given in the lower panel when the boundary is located at $R_{\max} = 24$ and $R_{\max} = 33.5$.

becomes small at scales comparable or larger than $\lambda_{\rm crit}$, the critical wavelength is essentially the same in both geometries. In fact, we have checked that our iterative scheme converges to the initial state as long as $\lambda_z \lesssim 7.5H$ (when $\alpha = 1$ is used), indicating that they are stable.

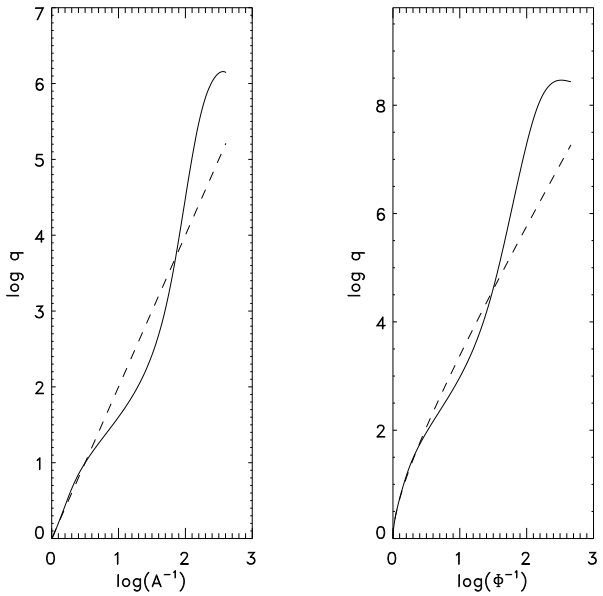

Fig. 3. The shape of the function $q(A)$ (left panel) and $q(\Phi)$ (right panel) in the initial state (dashed lines) and in the final state (solid lines), with $\alpha = 1$ and constant gravity, for $X_{\max} = 15$ and $Z_{\max} = 15$, respectively. Note that the range of the q-axis is different.

In the Cartesian atmosphere, M74 found that if the upper boundary is far enough from the galactic plane, i.e. $Y_{\max} \gg (1 + \alpha)$ in dimensionless units, the evolution of most of the matter in the domain is not affected by the location of the upper boundary. The reason is that more than 90% of the energy of the initial state resides under $y < 3.5(1 + \alpha)$ (see M74). In the axisymmetrical model, we can apply the same reasoning to expect that the solution is not significantly altered as long as the box size is much larger than the effective scaleheight, defined as the radius R at which Φ_0 decays by a factor e, namely, $4.3(1+\alpha)$ [note that the effective scaleheight of A_0 in the Cartesian model is $2(1 + \alpha)$]. In Figure 2 we compare the the magnetic flux of the final state in the axisymmetrical model using $\alpha = 1$ and $\lambda_z/2 = 12$, when the upper boundary, $R_{\max}$, is located at 24 and at 33.5. We see that both maps are almost identical at $R < 20$. The main difference is that the upper magnetic field lines in the magnetic bulge region inflate further out when the boundary is far away, because a larger column of material is unloaded and brought down to the valley of the curved magnetic field lines. Therefore, this upper region becomes lighter and more buoyant. By contrast, cuts of Φ along the valley $z = 0$ are very similar in both cases (see the lower panel of Figure 2). This means