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Filtered Lie conformal algebras whose associated graded algebras are isomorphic to that of general conformal algebra gc_1

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Let G be a filtered Lie conformal algebra whose associated graded conformal algebra is isomorphic to that of general conformal algebra gc_1. In this paper, we prove that $G\cong gc_1$ or ${\rm gr\,}gc_1$ (the associated graded conformal algebra of gc_1), by making use of some results on the second cohomology groups of the conformal algebra $\fg$ with coefficients in its module $M_{b,0}$ of rank 1, where $\fg=\Vir\ltimes M_{a,0}$ is the semi-direct sum of the Virasoro conformal algebra $\Vir$ with its module $M_{a,0}$. Furthermore, we prove that ${\rm gr\,}gc_1$ does not have a nontrivial representation on a finite $\C[\partial]$-module, this provides an example of a finitely freely generated simple Lie conformal algebra of linear growth that cannot be embedded into the general conformal algebra gc_N for any N.

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