

## ABSTRACT

In the middle of São Francisco river valley, in Verde Grande river sub-basin, Varzelândia, Verdelândia e Jaíba municipalities (total area 5000 km<sup>2</sup>) are located. As in several municipalities in the arid region of Minas Gerais, the exploitation of groundwater such as what was used in this study is very important to meet public and private demands of water in quantity and quality suitable for consumption, irrigation and supplying livestock needs. In this region there are more than 300 water boreholes in the pelito-carbonatics rocks domain of the Bambuí Group. The karstic-fissural system composed by these rocks has been the target of research due to occurrence of waters with high fluoride concentrations. The consumption of fluoride-enriched waters (concentrations higher than 1,5mg/L of fluoride) can cause dental fluorosis, as diagnosed in the population of Amargoso community (Verdelândia) and Mocambinho (Jaíba). In general, the factors that affect the natural concentrations of fluoride in groundwater are related to the abundance of fluorine minerals in the rocks, the time of water-rock interaction, the water circulation system, the influence of climate, and chemical reactions occurring along the groundwater flow. The aim of this study was to investigate the geological and hydrogeological factors that influence the spatial distribution of fluoride and the chemical composition of waters in aquifers of the Bambuí Group. Initially a geological mapping with the faciologic study was done in order to characterize the stratigraphic units and describe the textural and compositional variations in the mapped units. The amount of fluorite occurrences and the facies more enriched in fluorine was determined from petrographic studies, mineralogical analysis and analysis of fluorine content in the rocks. A physical and behavior model of the aquifer system was developed based on constructive and hydrodynamic characteristics of boreholes, on geological map, potentiometric map and isotopes of natural tritium in groundwater. The structural control of the flow was investigated by establishing relations between fractures directions, karstic features and relief lineaments. Finally, the results of hydrochemical studies were analyzed based on a hydrogeological model targeting the identification of conducive conditions for high concentrations of fluoride. Studies have shown that Bambuí Group study area consists of two carbonatic aquifer units separated by an aquitarde. The more fluorine enriched facies are calcarenite and calcirudites, with oolites and intraclasts, present in the carbonatic aquifers of Lagoa do Jacaré formation and Serra da Saudade formation. Boreholes located less than 250 meters from lineaments (linear features on relief that correspond fractures, faults and karstic features in subsurface) have high flow rates, waters with lower salinity and lower fluorine concentrations. Boreholes associated with NNE and WNW lineaments may have fluoride concentrations greater than 0,8 mg/L due to concentration along the flow. The waters are unsaturated with respect of fluorite reaching high concentrations in regional and deep flows, that present waters with long renovation time (tritium concentrations less than 0,5 UT), higher temperature, and high Na/Ca rate.

**Keywords:** *Bambuí Group, Fluorine, karstic aquifer*