AOGS 2005

Explanations of spouting dynamics of a geyser (periodic bubbling spring) and estimation of parameters under it based on a combined model combining the mathematical model (a static model) and the improved dynamical model of one

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We have proposed a mathematical model (Kagami, 2000), a dynamical model (Kagami, 2002) and a modified dynamical model of a geyser (a periodic bubbling spring)[1] based on observation of Hirogawara geyser (Yamagata, Japan) (Ishii et al., 1999) and model experiments of the geyser (Katase et al., 1999). Numerical simulations of the modified dynamical model reappear dynamics of spouting of geysers (periodic bubbling springs) and it becomes possible that parameters (volume of the underground space, depth of spouting hole and so on) under a geyser are estimated due to comparison between results of simulation and those of observation. Then we have reported trials that we compared results of numerical simulation with those of observation of Hirogawara geyser or Kibedani geyser (Shimane, Japan) and estimated parameters under Hirogawara geyser or Kibedani geyser due to the comparison (Kagami, 2003). Subsequent additionally improved dynamical model enabled reproduction of characteristic time variation of a position of the interface between the lump of water in the hole and atmosphere during spouting of Kibedani geyser. On the other hand, a pause mode among 2 modes (spouting andpause) of Kibedani geyser can not be reproduced by the dynamical model. But it can be explained by a mathematical model (a static model) (Kagami, 2000). Therefore a chain of dynamics of Kibedani geyser's spouting can be expressed completely by a combined model combining the additionally improved modified dynamical model with the mathematical model. Concerning common parameters to both models equal value has to be had in each model. In this sense, this combined model can be considered to connote a role as verification of estimated values of parameters.
In this presentation, we will introduce this combined model and report estimation of parameters under Kibedani geyser based on comparison between results of simulation of this combined model and those of observation of Kibedani geyser.

References

[1] Kagami, H., Proceedings of The 38th Conference of Sciete Internationale des Techniques Hydrothermales and The 56th Annual Meeting of the Balneological Society of Japan, 55-60, 2003.