



RESERVOIR TEMPERATURE CALCULATION OF IMMATURE GEOTHERMAL WATER FROM HOT SPRING AROUND THE SLAMET VOLVCANO

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The research location is located around Slamet Volcano,
Banyumas and Brebes Districts, Central Java



Research Site



Introduction

Around Slamet Volcano in Central Java, the presence of a geothermal system is illustrated, among others, in the presence of several hot spring manifestations



Introduction

Southern slopes (Baturaden area):

- Pancuran-3
- Pancuran-7

Northern slopes (Guci area):

- Pancuran-13
- Pengasihan



Introduction

Northwest slopes (Sigedong area):

- Sigedong



Introduction

- Calculation of the reservoir temperature from immature water sometimes makes uncertainty.
- This research was conducted to determine the temperature of geothermal reservoirs from hot springs that are in immature water conditions as happened in the five hot springs



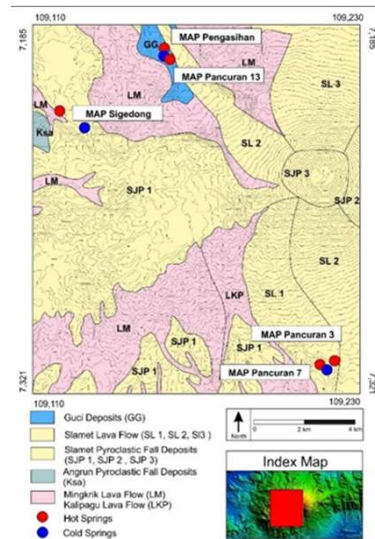
Regional Geology

The research area is part of the Slamet Volcano complex is composed of several units of the rock which derive from Slamet Volcano Eruption Products (Sutawidjaja et al., 1985).

- Lava Flow of Mingkrik (old slamet volcano products)
- Lava Flow of Kalipagu (old slamet volcano products)
- Fall of the Piroclastics Angrun
- Slamet Falling Pyroclastic
- Slamet Lava Flow



Regional Geology



Research Methods

- Geochemical methods:
 - Water type (Cl-SO₄-HCO₃)
 - Geothermometer (Na-K-Mg)
 - Geoindicator (Cl-Li-B)
 - Enthalpy vs. silica
- Chemical data from previous researchers:
 - Juhri, et al, 2016
 - Sumaryadi, 2014



Results and Discussion

Table 1 : Chemical data of the hot spring water in the study area.

Component (mg/l)	1	2	3	4	5
Temperature (°C)	50	46	40,5	50,4	41,5
Na	389	377	57	129	61
K	76	77	24	36	17
Mg	185	185	29,8	46,1	11,04
Li	0,67	0,58	0,02	0,06	0,08
B	4	4	3	7	1
Cl	754	724	17	44	20
SO ₄	609	600	33	89	3
HCO ₃	687	695	346	549	335
SiO ₂	169	164	121	135	128

Information
1 = Pancuran-7 (Juhri et al, 2016)
2 = Pancuran-3 (Juhri et al, 2016)
3 = Pancuran-13 (Juhri et al, 2016)
4 = Pengasih (Juhri et al, 2016)
5 = Sigedong (Surmayadi, 2014)



Results and Discussion

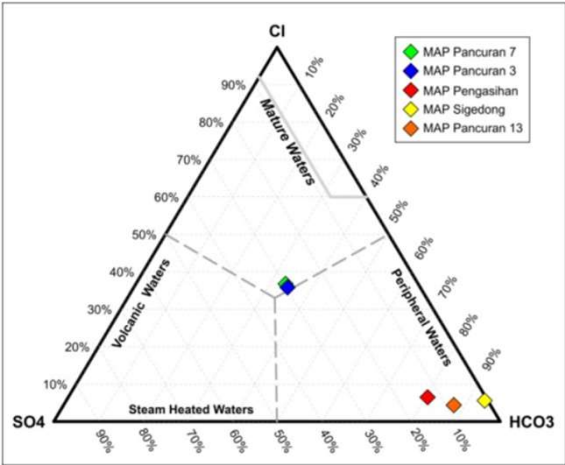


Figure 3 : Type of water of hot spring water in the study area.



Results and Discussion

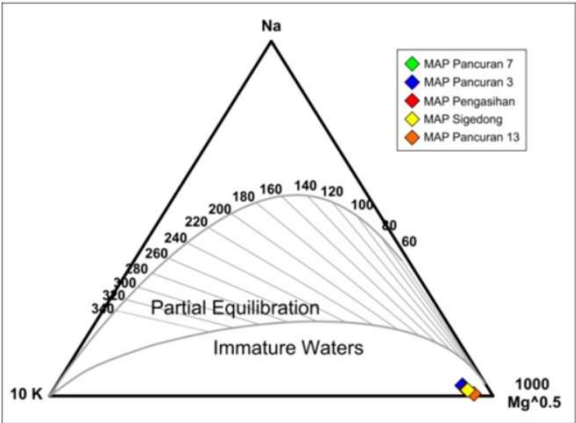


Figure 4 : Geothermometer calculation and indication of immature water conditions of geothermal manifestations.



Results and Discussion

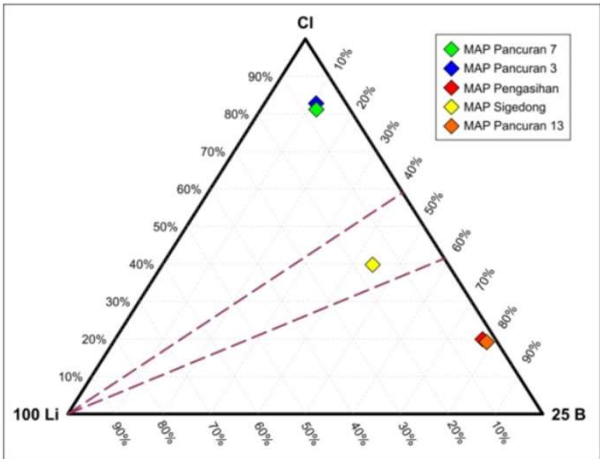
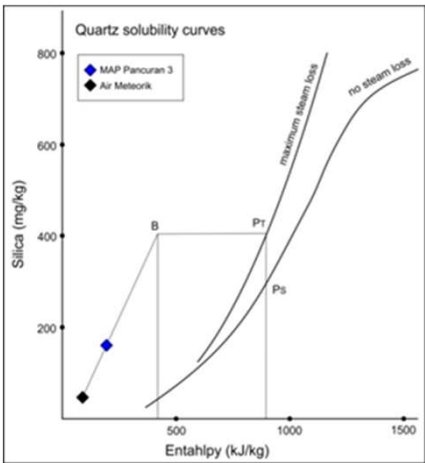
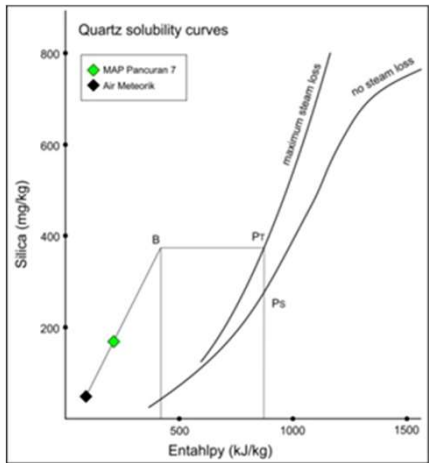


Figure 5 : Geoindicator of hot spring research area.



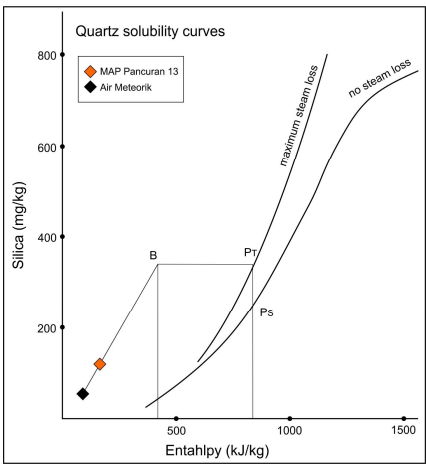
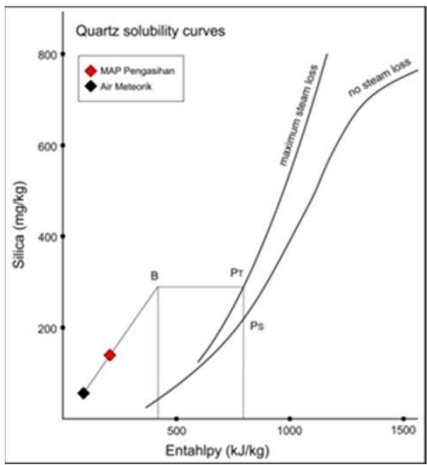
Results and Discussion



Enthalpy vs. silica content diagram of Baturaden Reservoir



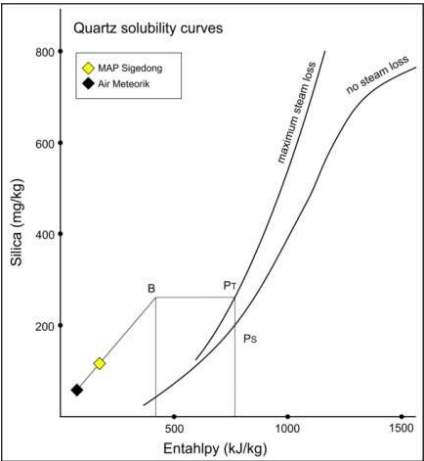
Results and Discussion



Enthalpy vs. silica content diagram of Guci Reservoir



Results and Discussion



Enthalpy vs. silica content diagram of Sigedong Reservoir



Results and Discussion

Table 2: Calculation of reservoir temperature using the Silica-Enthalpy and Na / K (Truesdell, 1976 in Nicholson, 1993) methods

No.	Manifestasi	Si-enthalpy	Na/K
1	Pancuran-7	204	280 ^a
2	Pancuran-3	210	286 ^a
3	Pengasih	187	429 ^a
4	Pancuran-13	196	340 ^a
5	Sigedong	181	340 ^b



Conclusion

- The five hot springs of Pancuran-7, Pancuran-3, Pancuran-13, Pengasih, and Sigedong in the research area are in immature water.
- This condition makes hot springs is difficult to used in determining reservoir temperature by the geothermometer method
- Based on the geoindicator analyses, there are three geothermal systems that work in the study area, namely Baturaden, Guci and Sigedong Systems or Reservoir
- Geothermal reservoir temperature in the study area for Batudaren, Guci, and Sigedong Reservoirs were 204°C - 210°C, 187°C - 196°C and 181°C.



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