

TABLA DE CONTENIDO

1. Introducción	1
1.1. Estructura de esta tesis	1
1.2. Formulación del problema	1
1.3. Ubicación y vías de accesos	3
1.4. Marco geológico	3
1.5. Hipótesis de trabajo	5
1.6. Objetivos	5
1.6.1. Objetivo principal	5
1.6.2. Objetivos específicos	5
1.7. Metodologías	6
2. Eruptive parameters and pre-eruptive processes for Late Holocene activity centred at Melimoyu volcano, Southern Chile (44°05' s)	9
2.1. Introduction	9
2.1.1. Geological background	12
2.1.2. Previous research on melimoyu-sourced post-glacial activity	12
2.1.3. Other volcanoes	13
2.2. Methods	14
2.2.1. Sieving and grain-size	14
2.2.2. Dating	14
2.2.3. Eruptive parameters	15
2.2.4. Whole rock chemistry	15
2.2.5. Glass and mineral chemistry	16
2.3. Results	19
2.3.1. Tephra descriptions	19
2.3.2. Dating	23
2.3.3. Eruptive parameters	25
2.3.4. Geochemistry	30
2.3.5. Mineralogy and petrography	34
2.3.6. Thermobarometry	45
2.4. Discussion	49

2.4.1. Last 20 kyrs activity of Melimoyu volcano.....	49
2.4.2. Eruptive parameters of M1 and M2.....	54
2.4.3. Pre-eruptive conditions of M1	57
2.4.4. Relationship between Melimoyu's eruptions.....	60
2.5. Conclusions	66
3. Bibliografía.....	69
4. Anexos	78

INDICE DE FIGURAS

Figure 1 Location map for Melimoyu volcano.....	10
Figure 2 Zoom of the western side of Melimoyu volcano.	19
Figure 3 Stratigraphy of a representative section of deposits to the E side of Melimoyu volcano.....	20
Figure 4 Stratigraphy of sections studied of deposits to the western side of Melimoyu volcano.....	23
Figure 5 The four localities on the western side that preserve Melimoyu pyroclastic units.	25
Figure 6 Isopach maps of M1, M1s and M2 units.....	27
Figure 7 Isopleth maps of M1p, M1s and M2 units.....	29
Figure 8 Whole-rock compositions of all units found in this study.	30
Figure 9 Variation diagrams of some major and trace elements showing the whole-rock compositions of M1p, M1s, M2 and one lava from Melimoyu volcano.....	32
Figure 10 Primitive mantle-normalized spider diagram and REE patterns	33
Figure 11 Selected backscattered electron images of representative glass shards..	35
Figure 12 Selected major element compositions variations of glass shards from MEL1 and MEL2 tephras collected in time series.....	38
Figure 13 Backscattered electron images of plagioclase phenocrysts in magmas from MEL1 (lower) and MEL2 (upper) eruptions sourced from Melimoyu volcano..	39

Figure 14 Plagioclase phenocrysts and microlites compositions from MEL1 (lower) and MEL2 (upper) eruptions sourced from Melimoyu volcano.	40
Figure 15 Backscattered electron images of amphiboles phenocrysts in magmas from M2 (A,B) and M1p (C,D).....	41
Figure 16 Amphiboles phenocrysts composition of M1p and M2 units.	42
Figure 17 Backscattered electron images of olivines, clinopyroxenes and orthopyroxenes phenocrysts in magmas from M1, M1s and M2 units.....	43
Figure 18 Olivine and pyroxene compositions of the studied samples..	45
Figure 19 Stability P-T fields.....	46
Figure 20 Temperatures obtained by geothermometry	47
Figure 21 A) Ti versus Rb and B) Sr versus Ba graphs modified from Stern et al. (2015).	51
Figure 22 La/Yb versus Zr/Nb for the lava flow and tephras of Melimoyu eruptions, and tephra layers of Stern et al. (2015) associated to Melimoyu.....	52
Figure 23 Eruption volumes for volcanic centers of the southernmost part of the SVZ between 42°-46° from Late Glacial and Holocene time..	54
Figure 24 Mingled pumices of M1 eruption..	58
Figure 25 An zoning profiles on plagioclases of M1p.	59
Figure 26 SiO ₂ -K ₂ O-FeO wt% variation in glass from M1p, M1s and M2 units.	61
Figure 27 Mixing models between M1p and M1s composition to obtain M2 chemistry. .	62
Figure 28 Results of fractional crystallization models.....	64
Figure 29 Holocene eruptions of Melimoyu volcano.....	67

INDICE DE TABLAS

Table 1 Whole-rock major and trace element compositions determined by XRF and ICP-MS.....	17
Table 2 Granulometric parameters for selected tephra sections	21
Table 3 Summary of radiocarbon ages reported in this study and from previous studies.	24

Table 4 Eruptive parameters of Melimoyu Holocene eruptions.	26
Table 5 Ratios of trace elements of M1p, M1s, M2 and samples from western side.....	31
Table 6 Modal mineralogy (vol.%) of Melimoyu eruptions	34
Table 7 Summary of the mineralogical characteristics of Melimoyu eruptions.	36
Table 8 Summary of pressures and temperatures obtained in this study.....	48
Table 9 Ratios of trace elements of M1p, M1s, M2 and samples from Stern et al. 2015.	50
Table 10 Distribution coefficients for the phases fractionated in fractional crystallization model.	63