CSD, crystal shape and connectivity in synthetic basalt from 3D reconstruction by X-ray CT image

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In-situ observation of plagioclase crystals in synthetic basalt by using micro-tomography beam lines at SPring-8, is supported from two previous experimental studies realized on same run charge [1,2]. It is here proposed to quantify crystal agglomeration and connectivity (touching crystals/non touching crystals) during crystallization and also to improve corrections applied in 2D CSD. By using micro-tomography beam lines and softwares (©Slice and ©Blob3D), three-dimensional images of the run products at a resolution of 2.74 μm are created. Size and shape evolution during cooling are clearly outlined by variation of the shape factor. A first comparison between 2D/3D CSD shows similarity in the CSD morphology. The connectivity (Fig. 1) between plagioclase crystals increases very rapidly with a ratio of 0.2 to 0.4 in the early stages of crystallization (5% plagioclase crystals) to 1 for 20-25 % of plagioclase crystals in the late stages. Processes of crystals agglomeration do not appear of major importance compared to connected crystals that form a continuous 3D network. This early crystal network strongly influences magma rheology.

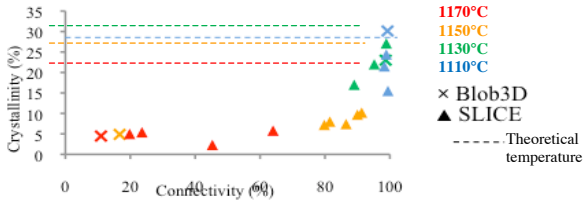

Fig. 1: Plagioclase crystallinity function of plagioclase connectivity

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Marine aerosol activation to CCN and cloud formation

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Marine aerosol occurring in cloud condensation nucleus (CCN) sizes suggest that it may contribute notably to the CCN population [1, 2], but further cloud droplet number concentration (CDNC) would strongly depend on the ambien (cloud) conditions, such as avialable water content, supersaturation and competition between the CCN of different composition [3]. Since the global importance of marine aerosol particles to the cloud formation was postulated several decades ago [4], it has progressed from the evaluation of the nss-sulphate and sea salt effects to an acnowledgement of the significant role of organic aerosol [5]. It was demonstrated that primary marine organics, despite its hydrophobic nature, can possess the high CCN activation efficiency, resulting in the efficient cloud formation [6]. Here we show the relationship between the marine boundary layer aerosol composition, CCN activation and CDNC for different aerosol and ambient conditions. We investigate the activation of sea spray composed of the sea salt and externally mixed with nss-sulphate as well as the sea spray highly enriched in organics, stressing the importance of the latter to the formation of the cloud droplets. We also explore the suitability of existing theories to explain the different composition marine aerosol activation to CCN and resulting CDNC.

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