Volcanological and Tectonic Reassessment of the Mývatn Area (Iceland): Stratigraphy, Morphology, and Dynamics of Laxá Lava Flows

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Résumé

The Mývatn region, within Iceland's Northern Volcanic Zone, is organized by NNE–SSW fissures (Lúdentsborgir, rengslaborgir) that remained active during the 1975–1984 Krafla rifting. It hosts vast postglacial basaltic fields-the Older and Younger Laxá Lavas (OLL, YLL)-and > 6,500 rootless cones formed by lava–water interactions. The OLL (_˜3800 BP) is a fluid basaltic pāhoehoe with smooth, lobate to ropey surfaces and chemistry similar to the YLL (Thorarinsson, 1953). The YLL (_˜2150 BP) is an olivine tholeiite with _˜10–15% plagioclase (An85–90) phenocrysts (Thorarinsson, 1953; Hoskuldsson et al., 2010).
Our new mapping and petrography revise this framework:

- **Older South Mývatn Lava (ex-OLL)** is an olivine tholeiite bearing 2–3% plagioclase phenocrysts and _˜30% plagioclase agglomerates. Its volume is modest (> 1 km^3, not 4–8 km^3) and it is absent from both the Laxá valley and the Aaldalur plain. Its emplacement likely created the Mývatn protolake. **Younger Laxá Lava (YLL) is divided in two phases, separated by a rifting event.** In each phase, lava is an olivine tholeiite with _˜10–15% plagioclase phenocrysts.
  - **YLL1** is a large (_˜4.4 km^3) pāhoehoe issued from the Lúdentsborgir–rengslaborgir fissures. It shows ropey to slabby surfaces and abundant lava tubes, with an overall W→E transport. YLL1 built the Dimmuborgir rootless shield and the Garsbuni surface, and generated extensive rootless-cone fields across the Mývatn basin, Laxárdalur, and Aaldalur.
  - **YLL2** fed mainly by rengslaborgir (with subordinate Lúdentsborgir input) is rubbly to platy-ridged pāhoehoe, locally folded. From the vents it advanced westward, skirted Villingafjall, then was funneled north along the western margin of a hemigraben parallel to the eruptive fissures, overrunning and incising Garsbuni. Near Dimmuborgir it split: one lobe turned NNE, the other swung west, bypassing the existing Dimmuborgir shield.

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These results depict a complex volcanotectonic evolution in which successive eruptions interacted with rift-related deformation to sculpt the modern Mývatn landscape. The two successive phases YLL1 and YLL2 could correspond to the two flow recognized by Thorarinsson (1951) during the Laxargljufur drilling with OLL (=YLL1) and YLL (=YLL2), known to have the same petrography and chemistry.

Mots-Clés: Mývatn, Laxá Lava flow, Pahoehoe lava morphology, Rifting tectonics, Rootless cone