Physiography

Mauritius is situated in the Indian Ocean between latitudes 19° 50' S and 20° 30' S, and longitudes 57° 18' E and 57° 46' E (Fig 1.1). It is of volcanic origin and has a surface area of 1865 km^2. The Island consists of a Central Plateau surrounded by mountain ranges and plains. The Plateau rises to a maximum elevation of about 600 m (a.m.s.l) in the South of the Island, and has a mean elevation of about 300 - 400 m (a.m.s.l), the highest peak being 828 m (a.m.s.l).

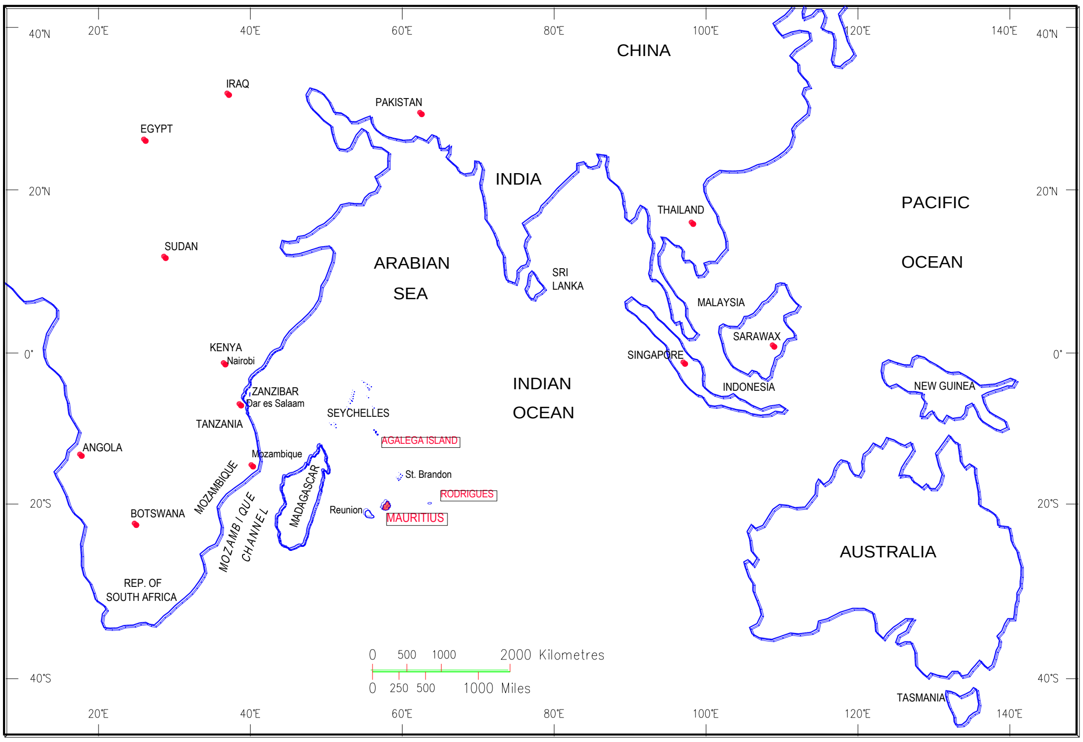


Fig. 1.1 –Location of Mauritius. Source : Atlas of Mauritius

Climate

Mauritius enjoys a tropical maritime climate with 2 seasons: summer from November to April, and winter from May to October. Summer is the rainier and warmer season, during which tropical cyclones occur. February is the wettest month. Winter is cooler and relatively drier. October is the driest month.

The average annual rainfall over Mauritius is 1993 mm equivalent to about 3700 Mm^3. Rainfall varies from 1400 mm on the Eastern Coast to 4000 mm on the Central Plateau and 600 mm on the Western Coast. The annual evaporation has been estimated as 30%, surface runoff as 60 % and the groundwater recharge as 10%. The total annual utilisable potential has been estimated as 1233 Mm^3. The annual number of bright sunshine hours varies from 2000 on the Southern part of the Central Plateau to 3000 in the North. The mean annual temperature ranges between 20-25° C. Extreme temperatures recorded range around 7.5° C (at night in winter) and 37.5°C (during the day in summer).

The annual potential evapotranspiration varies between 1100 mm and 1600 mm with small inter - annual variations. The relative humidity has an average value of 80%. The South East Trade Winds blow over Mauritius for the major part of the year at a speed reaching 50 km/h sometimes. Cyclones, however, produce high velocity winds, with gusts exceeding 250 Km/h.

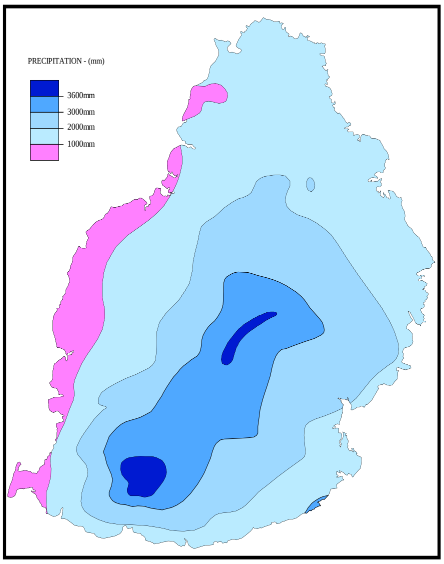


Fig. 1.2. Isohyetal map of Mauritius
Source : Meteorological Services

Schematic Structural Evolution of Mauritius

The geological history of Mauritius began 10 Million years ago (Table 1.1). Two great magmatic and structural cycles gave rise to volcanic formations. The first cycle was characterised by breccias and old lava formation and the second cycle by intermediate, recent volcanic lava and explosive formations. These two cycles are associated with the setting up of volcanic structures**:** collapse and subsidence of calderas.

6.7 Million years ago, a considerable collapse preceded the eruption and ponding of an important volume of lavas that resulted in a primitive “shield volcano”.

5 Million years ago, several subsidences affected this primitive “shield volcano” and gave it a form that was subsequently eroded by the prevailing atmospheric agents.

Between 5 and 3.5 Million years, a relatively calm period was observed. This volcanic lull, except for the deposit of the phonolites, allowed erosion to mould the tectonic cutting of the calderas and thereby cut deep valleys, (ancient topographic cuts at the caldera rims) which have been filled by younger lavas during the following volcanic episodes.

The volcanic activity of the island ended about 25,000 years ago.

Hydrogeology

The ancient basaltic formations of Mauritius are massive or weathered and can be considered in general as having very low permeability. Groundwater circulations seem to be limited to fractured and scoraceous zones (Fig. 1.3).

Detrital formations of important hydrogeological interest

In the central caldera and that of the Northern plains, boreholes located just above valleys nicked in the ancient bedrock have cut through sand and gravel layers. Important yields have been registered in these facies.

The intermediate series

Hydrogeological characteristics of the intermediate series have proved to be interesting, especially when the basalt strata are fractured.

Weathered Zones

The intermediary weathered zone is a clayish layer having low permeability and helps to create confined aquifers. Important springs appear to be at the base of recent formations in contact with the weathered reddish clay layer. (Springs of central Schoenfeld and Palmyre are examples).

The recent series

The recent series are made up of very porous and fractured basalt. The top surface of the lava flows, often scoraceous is very permeable resulting in little runoff and important recharge to the aquifers. Circulation of water in these formations is fast. In the Recent flows of vesicular basalts many tunnels which play an important role in the hydraulic regime of underground waters have been formed.

Hydrodynamic characteristics of aquifers in terms of transmissivity for the different geological formations are as follows:-

Recent Basaltic Series	: $10^{-5} – 10^{-2}$ m^2/s	Intermediate Basaltic Series	: $10^{-6} – 10^{-3}$ m^2/s
Ancient Basaltic Series	: $10^{-7} – 10^{-6}$ m^2/s	Fractured Medium	: $10^{-4} – 10^{-2}$ m^2/s
Carbonated Medium	: $10^{-4} – 10^{-3}$ m^2/s	Scoraceous Medium	: $10^{-3} – 10^{-2}$ m^2/s
Scoraceous Lava Tunnels	: at least 10^{-1} m^2/s		

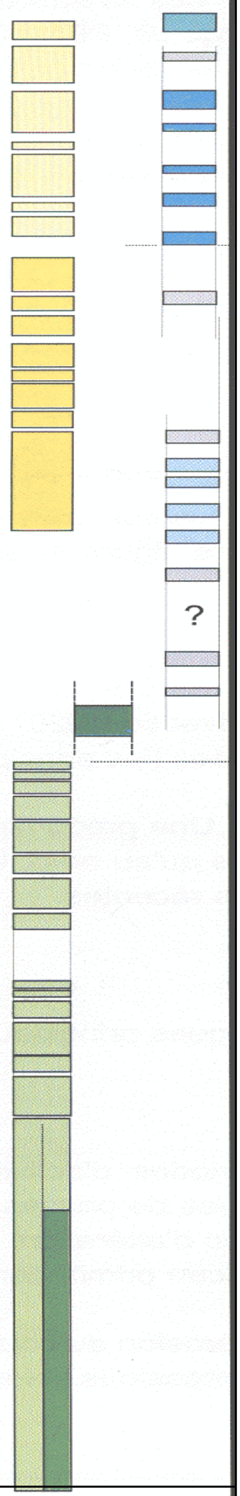
MAURITIUS Chronological events of lava flows/formations		
Age in M. years	Mauritius	Tectonic activity
0.2		Actual coral bioherms
0.4		Deep valleys alluvium – paleosol
0.6		Carbonated formations of coral origin
0.8		
1.0		Explosive episodes and /or effusive
1.2		
1.4		
1.6		
1.8		
2.0		
2.2		Explosive episodes and /or effusive
2.4		
2.6		
2.8		Deep valleys alluvium – paleosol?
3.0		
3.2		Carbonated formations of coral origin
3.4		
3.6		
3.8		
4.0		Alluvium of the deep valleys of the caldera
4.2	?	Period of quiescence
4.4		Alluvium of the deep valleys of the caldera
4.6		
4.8		
5.0		Setting up of the phonolites and trachytes
5.2		Collapse of the caldera
5.4		
5.6		Setting up of the ancient basalt
5.8		
6.0		
6.2		
6.4		Period of quiescence
6.6		Collapse
6.8		
7.0		
7.2		
7.4		
7.6		
7.8		
8.0		
8.2		
8.4		
8.6		
8.8		Setting up of basalts and breccia formations
9.0		
9.2		
9.4		
9.6		
9.8		
10.0		

Table 1.1 The Stratigraphic Series

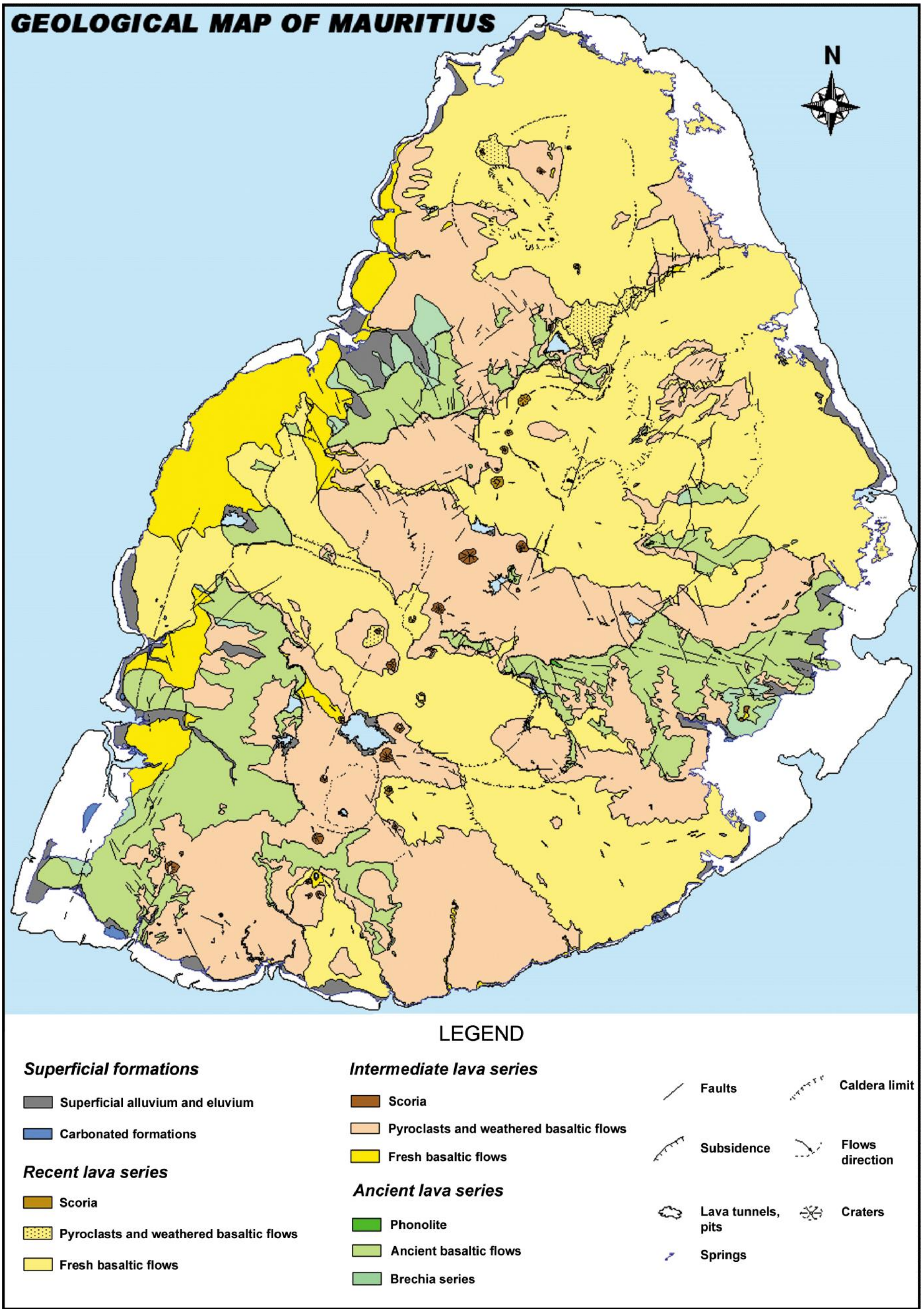


Fig. 1.3 – Geological Map of Mauritius

Aquifers of Mauritius

The aquifers of Mauritius (Fig. 1.4) have been formed during the intermediate and recent volcanic series.The ancient volcanic lava series which have guided the shaping of the aquifer is known to be impermeable. There is one known productive alluvial aquifer at Grande Riviere Noire.

The five main aquifers of Mauritius are:

I. The aquifer of Curepipe/Vacoas/Flic-en-Flac commonly known as the Curepipe aquifer.
II. Aquifer of Phoenix/Beau-Bassin/Albion –Moka/Coromandel.
III. Aquifer of Nouvelle France/Rose-Belle/Plaisance.
IV. Aquifer of Nouvelle Decouverte/Plaine des Roches/Trou d'eau Douce.
V. Aquifer of Northern Plains.

And the Secondary aquifers are:

- Aquifer of Chemin Grenier/Frederica (CG/F)
- Aquifer of Chamarel (Ch)
- Alluvial aquifers of Grande Riviere Noire/Sud Yemen and Vallee des Pretres
- Fractured aquifers at Chamarel and Bambous Virieux
- Carbonated aquifers such as: Mt Bambous and West of Case Noyale.

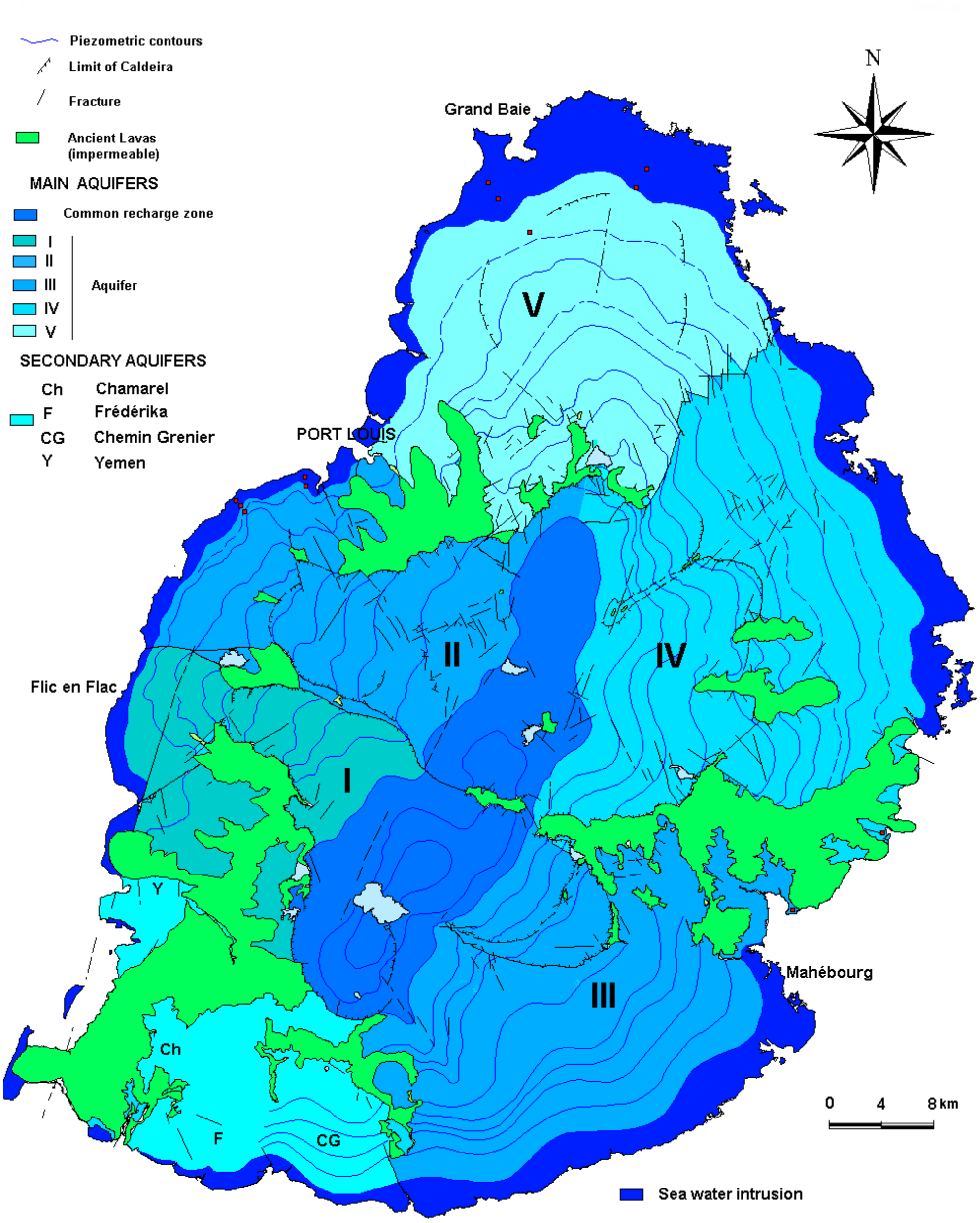
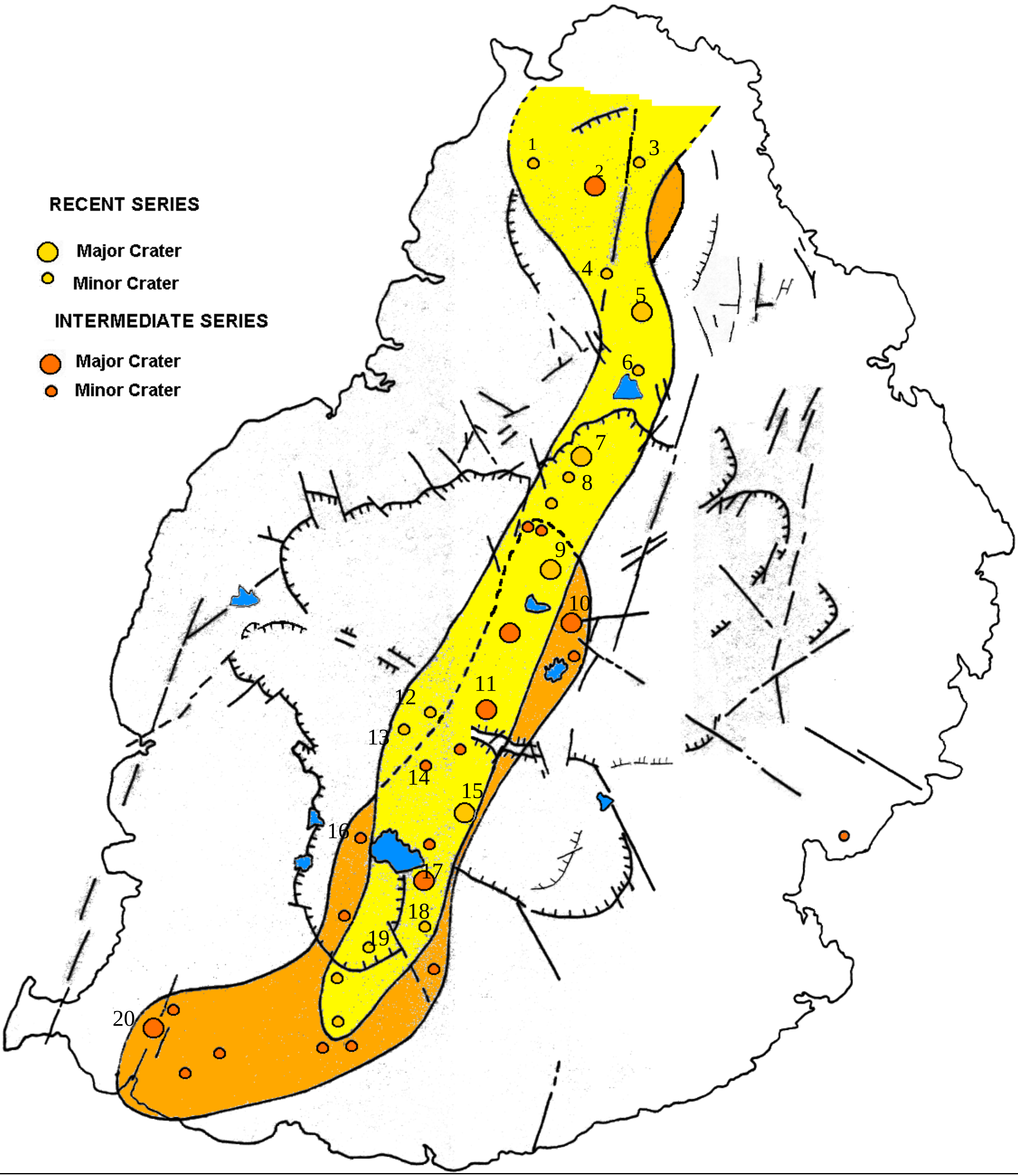


Fig.1.4 - Aquifers of Mauritius

Craters of Mauritius

The craters from which intermediate and recent lava flows originated are closely linked to fractured zones which are aligned along a general N20^0 direction.

The lava flows from these craters are very permeable and drain much rainwater. Fig.1.5 shows the location of these craters.



1. Mt Virer	**5**. Mont Piton	**9.** Alma Hill	**13.** Trou Aux Cerfs	**17**. Mt Peruche
2. Butte Aux Papayes	**6.** Mount William	**10**. Mt La Terre	**14**. La Brasserie	**18.** Kanaka Crater
3. Forbach Hill	**7.** Nouvelle Decouverte	**11.** Butte Chaumon	**15.** Curepipe Point	**19.** Grand Bassin
4. The Mount	**8.** Mt Bar le Duc	**12.** Malherbes	**16.** Trou De Mme. Bouchet	**20**. Baie Du Cap Cham

Fig 1.5 - Main Craters of Mauritius