Gross Greenhouse Gas Emissions from Brazilian Hydro Reservoirs

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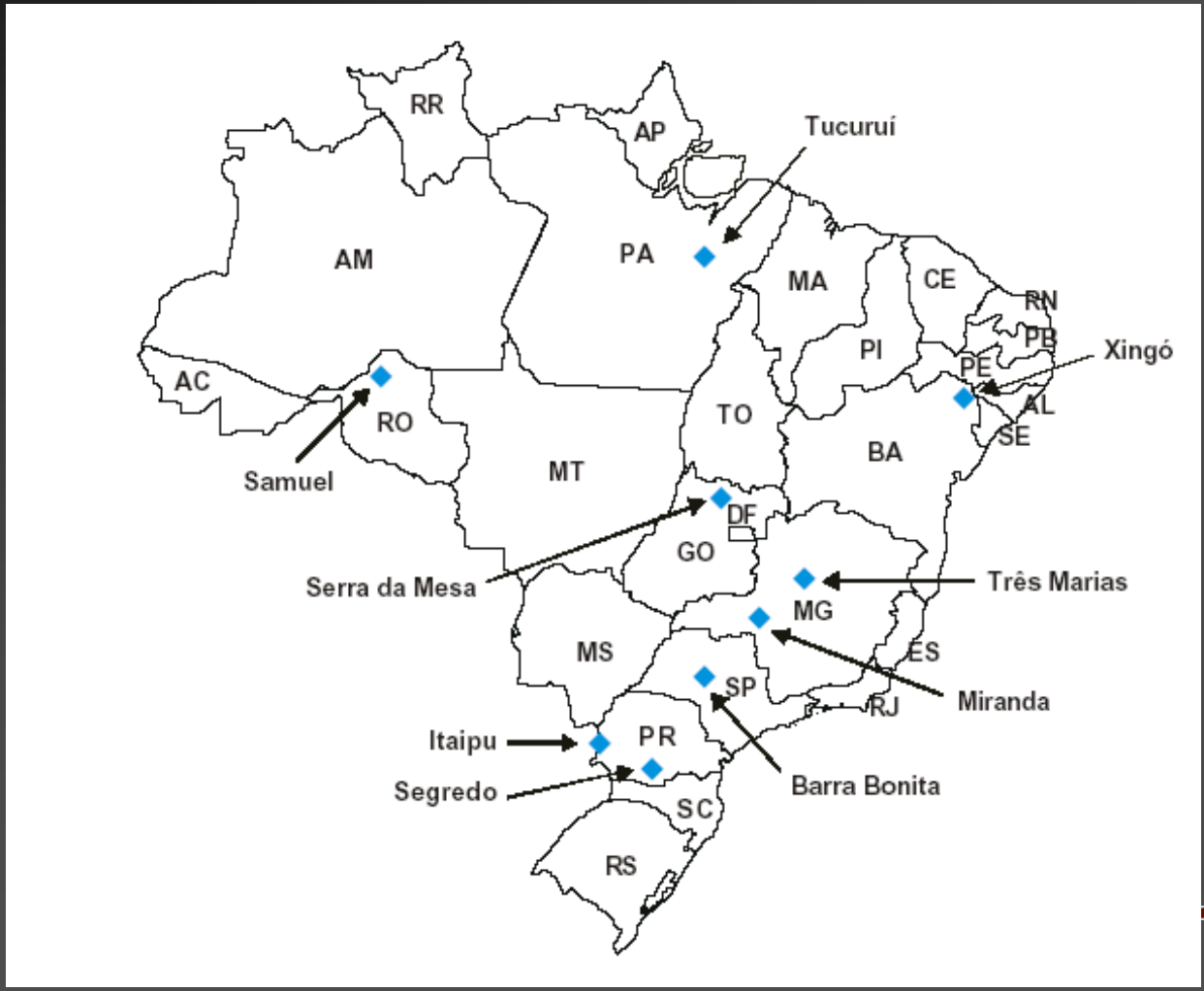
- A great variability was found in the intensity of emissions, linked to the influence of various factors, including temperature, depth at the point of measurement, wind regime, sunlight, physical and chemical parameters of water, the composition of the biosphere and the operational regime of the reservoir.

Location of hydroelectric facilities studied

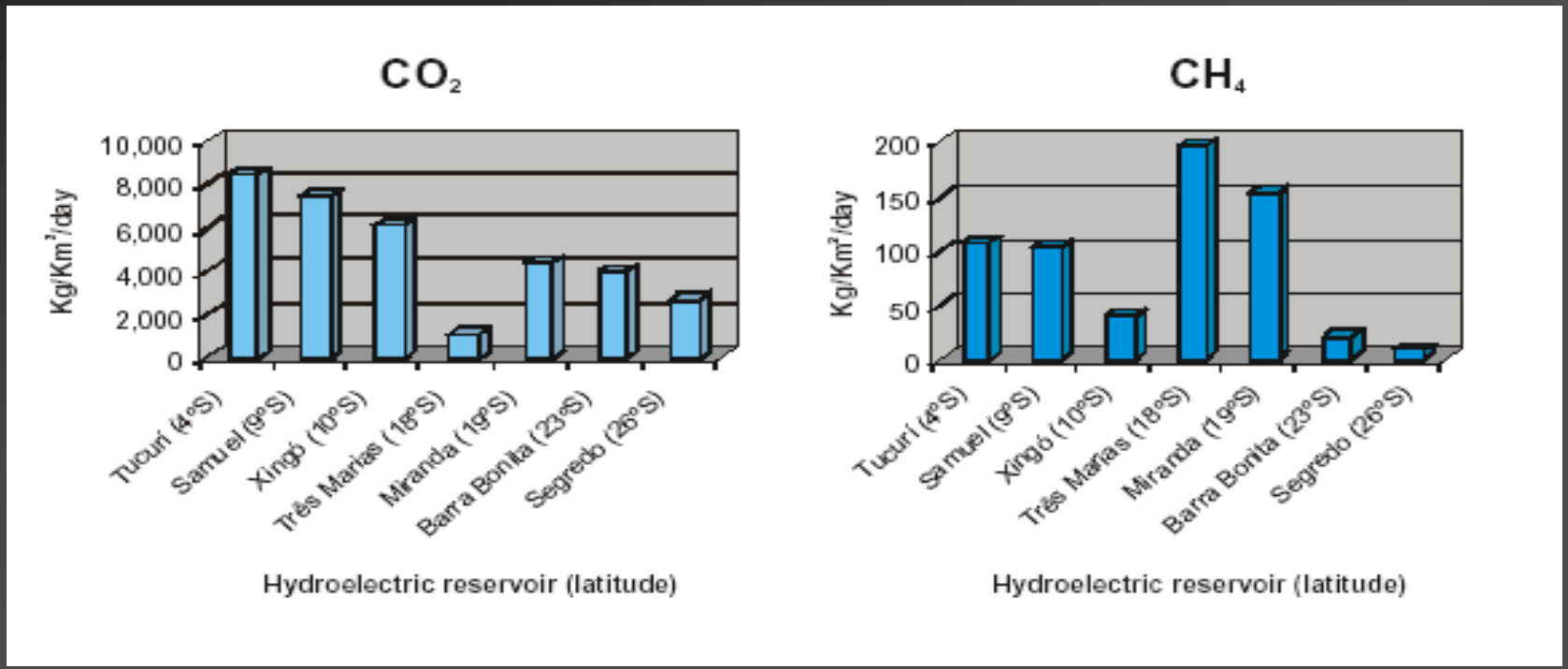


Major Characteristics of the Hydroelectric Reservoirs Studied

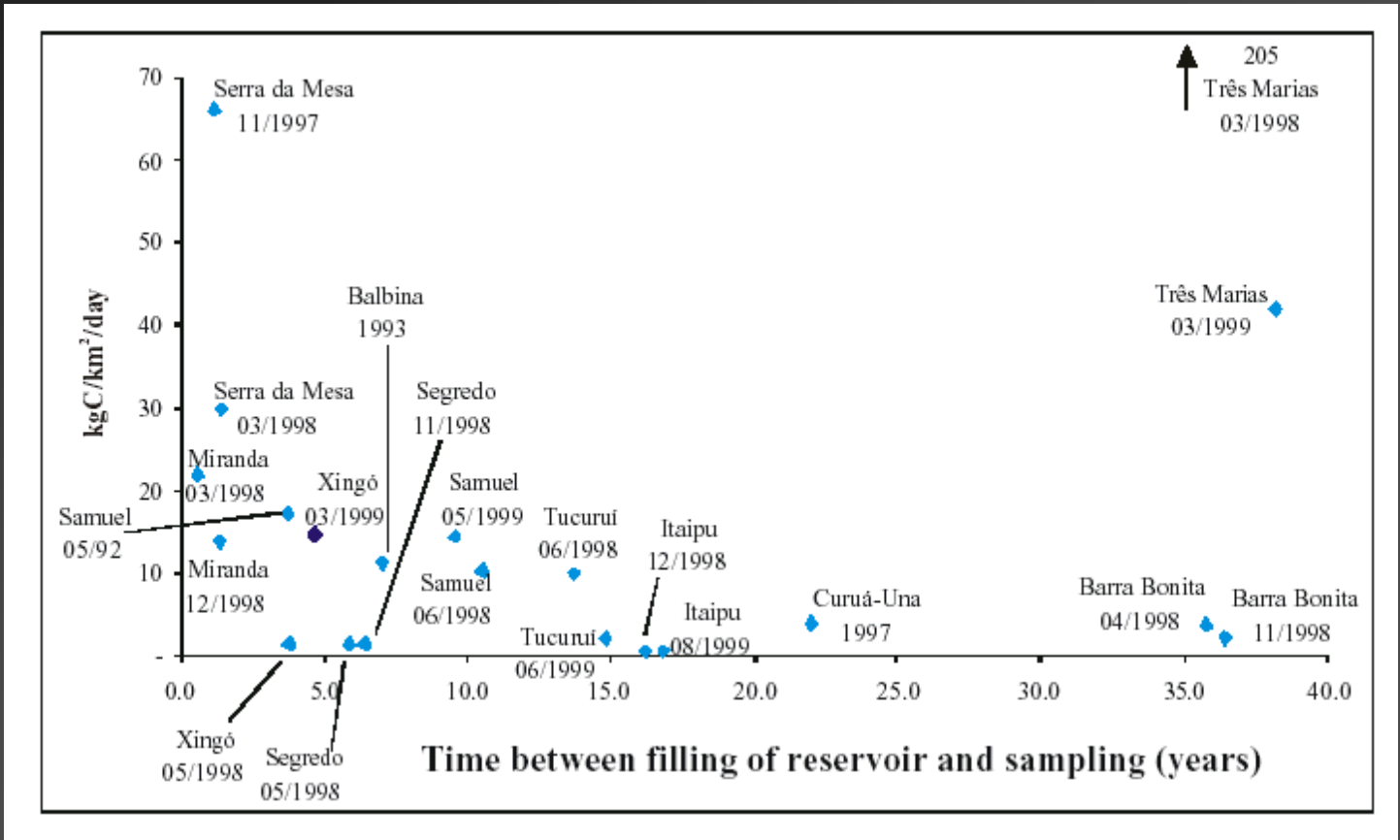
Station	Latitude	Biome	Capacity (MW)	Area of Reservoir (km^2)	Density of Generating Capacity (W/m^2)
Miranda	18°55'S	Cerrado	390	50.6	7.71
Três Marias	18°13'S	Cerrado	396	1,040	0.38
Barra Bonita	22°31'S	Mata Atlântica	140.76	312	0.45
Segredo	25°47'S	Mata Atlântica	1,260	82	15.37
Xingó	9°37'S	Caatinga	3,000	60	50.00
Samuel	8°45'S	Amazônica	216	559	0.39
Tucuruí	3°45'S	Amazônica	4,240	2,430	1.74
Serra da Mesa*	13°50'S	Cerrado	1,275	1,784	0.71
Itaipu*	25°26'S	Mata Atlântica	12,600	1,549	8.13

* Reservoirs studied in parallel surveys.

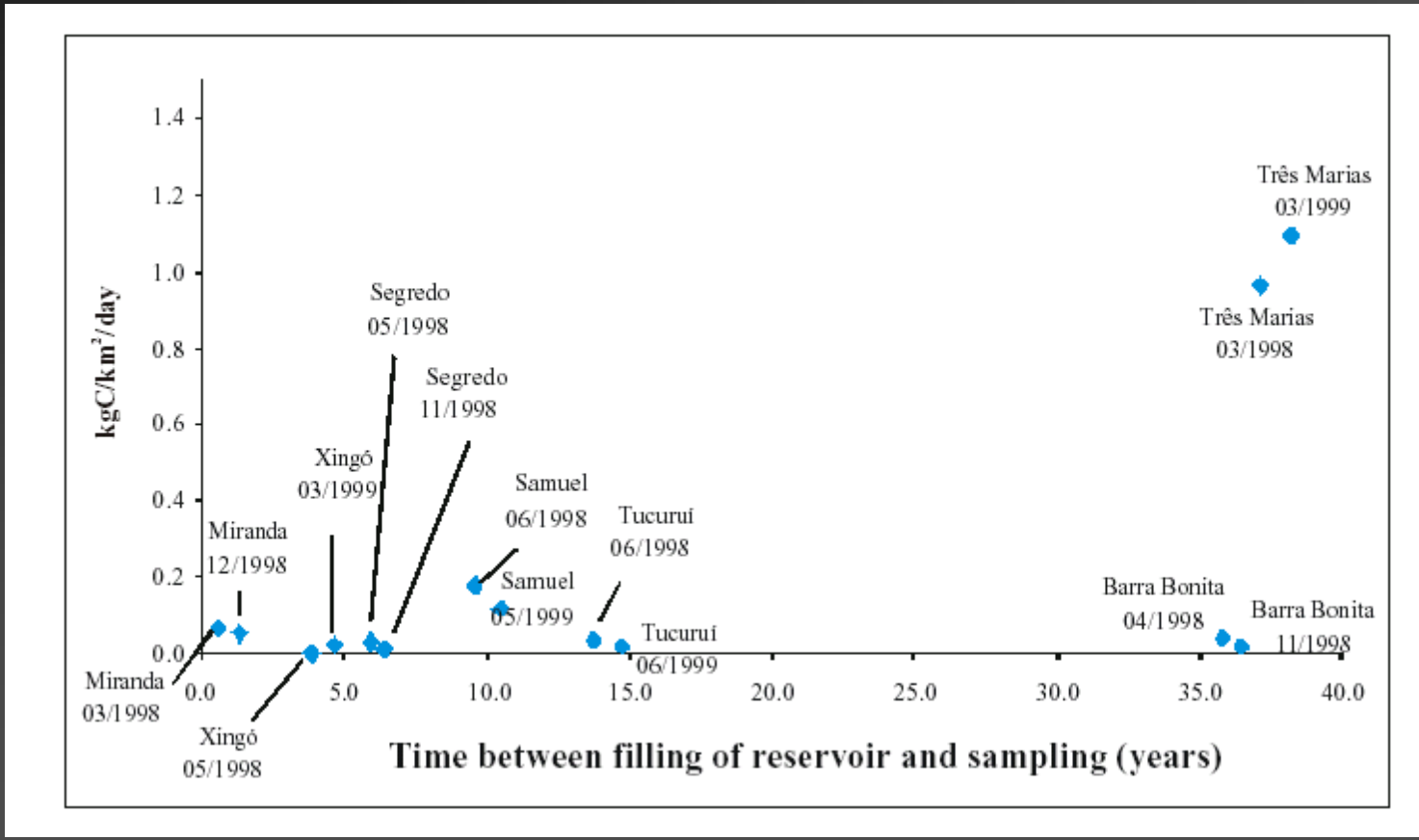
Emissions of CO_2 and CH_4 from Power-Dams Studied, in kg/km^2 /day



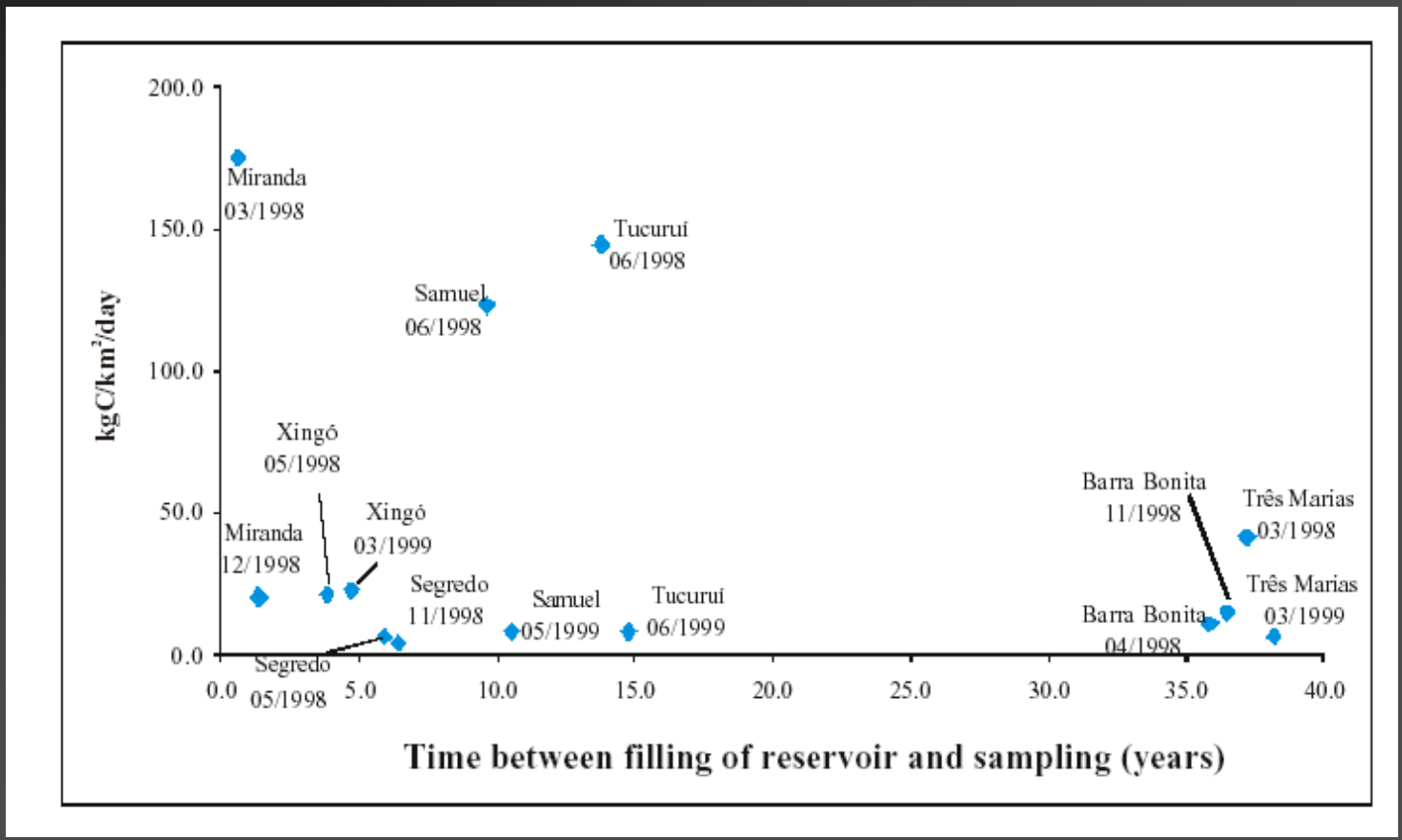
Average Carbon Emissions in CH_4 Emitted through Bubbles in Brazilian Hydroelectric Reservoirs



Average Carbon Emissions in CO_2 Emitted through Bubbles in Seven Brazilian Hydroelectric Reservoirs



Average Carbon Emissions in CH4 Emitted Through Diffusion in Seven Brazilian Hydroelectric Reservoirs



- These main topics should be developed in a near future:
- a) The mean values obtained until now have a level of uncertainty and new research on GHG emission from hydro reservoirs require improvement like as on line measurements;
- b) The experimental measures and assessment of specific sites can give only a partial view, reservoir vary greatly from one to another. However, such studies are necessary to supply data on the variability issue;
- c) The full life-cycle assessment should be included in future studies, as well as consider emissions pre-existing dam construction. Carbon cycle studies, like the preliminar experience conducted here should be encouraged, to determine carbon origin (natural and antrophogenic) in the whole watershed area;
- d) It is important to include in the IPCC a discussion of the role of the GWP index in comparing thermo power and hydro reservoir emissions.
- e) The carbon emitted to the atmosphere by the free surface of the water in hydroelectric reservoirs comes in part from organic material carried from the headwaters areas to the bed of large rivers and to the hydroelectric reservoirs. If this carbon, in the case of CO2 emissions, is from biomass, then it was previously removed from the atmosphere and thus its emission does not result in increased greenhouse effect. Thus the problem emerges of quantifying these contributions and the emissions of CH_4 and N_2O. This requires studies of the carbon cycle in the watershed/reservoir system,.