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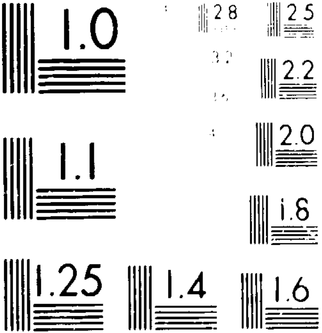
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South-South Cooperation in Mineral Resource-Based Industries - a Compendium

by

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1983

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Introduction

This is the condensed version of a paper entitled "South-South Cooperation in Mineral Resouce-based Industries", dated 1 December 1982.

The most essential difference is that the tables there, or the information considered essential in those, were converted to graph form.

Here as there, with a view to self-consistency, all figures concerning the reserve base and production figures have been taken from US Bureau of Mines Bulletin 671, Mineral Facts and Problems, the 1980 edition /except the data for fuels, which do not figure in that publication/. The data there have been converted into metric units and regrouped to fit the eleven-region UNITAD subdivision of the globe.

Further publications consulted a great deal and recommended to the reader include

- UNIDO: Mineral Processing in Developing Countries, ID/253,
- UNIDO: 1990 Scenarios for the Iron and Steel Industry, IS.213,
- UNIDO: Fertilizer Manual, ID/250,
- UNIDO: Second World-Wide Study on the Petrochemical Industry, ID/WG.336/3, and
- the periodical The Petroleum Economist.

Budapest, 15 January 1983

0 The mineral resource base

For large enough portions of continental Earth surface, mineral wealth, all minerals taken together, tends to be proportional to surface area. A great deal can be learnt about mineral wealth/poverty simply by looking at the surface area distribution of the 11 UNITAD regions /Fig. 1/. Specifically, the problem of Japan emerges with great clarity.

This does not mean that the distribution of each individual mineral over the regions is uniform as well. There are freak distributions like the concentration of petroleum and phosphate rock in the Near East or the shortage of potash in the South. Yet, taking all minerals together, both the North and the South can get by mineralwise without the other half of the globe. /The South, however, can get by better, not only because it has the greater land area but also because its annual consumption of each mineral is much less./

The important points here are that

1 any delinking would necessitate a restructuring of mineral production and trade patterns: the restructuring would have to be the more extensive and costly, the deeper the delinking,

2 an enhanced NN-SS cooperation would presuppose a reversal of the current trend of mineral exploration and mining (investment shifting from the South into the costlier but more secure resources of the North); such a reversal in its turn would presuppose adequate safeguards as to the security of mining investment to the investors, plus guarantees as to an equitable profit-sharing among the parties concerned, on Lomé Convention or UNCTAD Common Fund lines,

3 South-South cooperation in the extraction of a given mineral resource appears the more worthwhile, the less uniform the geographic distribution of that resource.

1 Petroleum refining

The resource base. World petroleum reserve distribution is strongly biased in favour of the Near East region. Eastern Europe and Latin America are the runners-up. The other developing regions are rather worse off than North America and no better off than Western Europe. /Fig. 2C./ The events since 1973 have demonstrated that the non-oil South is no less dependent on the petroleum-exporting countries than the North.

By and large, new petroleum discoveries keep up with consumption. In view of this and of declining consumption, no shortages of petroleum /except man-made ones/ are to be feared at least up to the end of the century. Nevertheless, the world-wide distribution of exportable petroleum, produced in a comparatively few countries, is a problem that still looms large. Since the countries hardest hit by the high petroleum prices are developing ones in the main, and so are the major petroleum exporters, this is clearly an important arena of South-South cooperation, one where much remains to be done.

The size of the problem. The regional distribution of petroleum production and of refinery capacity is shown in Figs. 2A and 2B. Refinery throughput practically equals petroleum consumption both world-wide and country by country, but refinery capacity utilisation was only 71 % world-wide in 1980 and has further declined since. Nevertheless, up to 1986 at least,

new refineries and the expansion of existing ones - about one-third of the total in the Near East - exceed the capacities to be scrapped /most of them in Western Europe/. This essentially means that refiners are squeezed between petroleum prices not sufficiently sensitive to a declining demand and consumers unwilling to pay the current product prices. In such a situation, two types of refiner will find themselves in a comparatively favourable situation: /1/ those who, owning and producing more petroleum than they can refine, can convert some of their crude exports into product exports and keep refinery residues as an industry fuel: given the huge profits on most crudes, a negative refining margin is purely an accounting convention in such a situation; and /2/ those who can expand or create refinery capacity in the shelter of an as yet unsaturated domestic market. The OPEC countries are likely to fall into the first group; developing countries with sizeable products markets into the second. The developed regions with their large excess refinery capacities will find themselves squeezed in the middle, in a classic case of input starvation.

The net exports/imports of the 11 UNITAD regions in energy petroleum products are shown in Fig. 3; interregional petroleum product movements among the market-economy regions are shown in Fig. 4. Only about 13 % of energy petroleum products enters world trade, as against more than 50 % for crude petroleum. The three regions that are net exporters of energy petroleum products are the Near East and Eastern Europe /the two greatest producers of crude petroleum/, plus, remarkably enough, Latin America, which is the most important of the three thanks to a number of transit refiners operating in the Caribbean. The South has an overall excess of refinery products output.

Scope for South-South cooperation. Since all the developed regions except Eastern Europe are net importers of petroleum, the petroleum-importing developing countries have traditionally been supplied by other, petroleum-exporting, developing countries /to the tune of 94.5 % of their total petroleum imports in 1976+/. In petroleum products, on the other hand, the developing-country share of developing-country imports in 1976 was 69.7 % only+. This latter figure may rise to 80 or 85 % by 1990. The total intra-South trade in crude plus refinery pro-

+ UNCTAD Secretariat, Statistics of Trade among developing countries by country and product, TD/B/C.7/36/Add.1,2,3. These tables count Rumania, Turkey and Yugoslavia as developing countries.

ducts, worth about $45bn in 1976, may well attain $70bn by 1990, in 1976 dollars.

Siting and expansion. Of the 254 countries and territories of the world, 114 have refineries, which makes petroleum refining the most widespread by far of the industries considered here. Of the 140 countries and territories that have none, 127 have a population of less than one million each. Of the remaining 23, 14 are land-locked. Between now and 1990, few developing countries /five-six at most/ will enter the petroleum refining scene /in some of these, new petroleum deposits will have been discovered/. Most of refinery expansion in the developing world should be expected to take place in the countries which already have sizeable refining capacities. Between 1975 and 1990, refining throughputs are expected to increase by a factor of 2.2 in Latin America, 2.1 in the Near East and 2.5 in Asia and India. African expansion may be by a factor of about 1.6.

Technology. In today's atmosphere of cutthroat competition, everyone wants the most modern processes and equipment /plant enhancing light and middle distillate recovery such as visbreakers, flexicokers, flexicrackers, hydrocrackers etc./. As a result, reliance on the developed market economies' engineering and consultancy specialists is almost total: those have among others the advantage of a global market awareness and of possessing the techniques needed to adapt to changes. Hence, even though building a modern refinery in, say, Brazil would need an import contribution of less than 20 % in money terms /project identification; basic engineering; some construction supervision; the most technologically advanced equipment including computer control and automation; catalytic processes/, developing countries are not expected to cooperate in refinery construction to any significant extent before 1990, except under a fairly harsh climate of delinking.

Other South-South cooperation. There are a few instances of joint ventures in refining, export-oriented refinery construction with the output spoken for by developing-country customers, South-South assistance in prospecting, refinery maintenance, refining personnel training and financing of refinery projects. Significantly, however, petroleum refining does not figure in the Asean Industrial Projects package, nor in "A Programme for the Industrial Development Decade for Africa"+, nor in any other document on South-South cooperation available at the time of writing. It seems as though the developing countried believed either that refining can take care of itself or that it is still dominated too much by the transnational corporations to be interfered with. Neither attitude is justified. UNIDO may, and should, take a hand in dispelling those attitudes.

2 Basic petrochemicals

The basic petrochemicals to be considered here are ethylene, propylene, butadiene, benzene, the xylenes and methanol. Ammonia is discussed in the chapter on fertilizers.

Basic petrochemicals are made out of natural gas or some refinery product such as naphtha, LPG /liquefied petroleum gas/, distillates in the diesel fuel range or refinery tail gas. Of these, only natural gas is a mineral resource. The availability of the others depends on refinery capacity and output patterns.

Resource base - natural gas. The distribution of world natural gas production and proven reserves over the 11 UNITAD regions is shown in Figs. 5A and 5B. Between 1970 and 1982, proven reserves more than doubled; gas reserves may be expected to keep ahead of consumption at least until the year 2000.

The South holds 42 % of proven world reserves but provides only 13 % of commercial gas production. Many of the gas-producing developing countries have plans for extensive gas-based industrialisation. Making bulk petrochemicals, predominantly for

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+UNIDO, ID/287, 1982.

export figures among the targets of many such countries.

The size of the problem. There is a considerable similarity between the problematiques of petroleum refining and of basic petrochemicals making. Basic petrochemicals capacity utilisation is very low, about 60 % in Western Europe. Demand growth is a mere 2 % per year.[+] The chemicals majors are pulling out of basic petrochemicals and concentrating on specialty products whose profit margins are better for the time being. Here again, two types of producer will find themselves in a comparatively favourable situation: those who own petroleum or natural gas and can therefore offset the book losses on the petrochemicals against the huge profits of hydrocarbon production, and those who, needing more petrochemicals than they can currently produce, can build up capacity in the shelter of a domestic market. Here too, OPEC countries are likely to fall into the first group and big-economy developing countries into the second. The developed regions with their excess petrochemicals capacities will be squeezed in the middle in another case of input starvation under the impact of the market forces.

Scope for South-South cooperation. International trade in the basic petrochemicals considered here is reflected well enough by their movements into and within the OECD group in 1979, not counting intra-regional movements within the OECD[++] /cf. also Fig. 6/:

Chemical	Movements, 10^3 t	Originating in the South, %	CPEs, %
Ethylene	87.7	22.0	-
Propylene	402.3	-	-
Butadiene	461.8	1.0	0.4
Benzene	611.9	7.2	17.9
Xylenes	757.2	7.1	5.6
Methanol	1119.8	50.1	7.6

[+] The Economist, November 6, 1982, p. 20.

[++] UNIDO, ID/WG.336/3/Add.1, 20 May 1981, pp. 123-124.

In 1979, the developing countries' output and demand were in a rough balance in ethylene, propylene and butadiene; there was a benzene deficit of 120,000 tons, a xylenes deficit of 140,000 tons, and a methanol surplus of 380,000 tons. In that year, developing countries exported to the OECD group of countries about 20,000 tons of ethylene, 5,000 tons of butadiene, 45,000 tons of benzene, 55,000 tons of xylene and 560,000 tons of methanol. Clearly, there was some Southern demand satisfied out of Northern imports while the South kept exporting to the North. Short-circuiting these trade flows by South-to-South transactions is a fairly clear-cut option of South-South cooperation in basic petrochemicals.

Siting and expansion. The number of developing countries having basic petrochemicals-producing facilities is fairly small /in 1979, 13 for ethylene, 10 for propylene and less than 10 each for the other four chemicals/. Only six countries /India, the Republic of Korea, China, Argentina, Brazil and Mexico/ had the full range in 1980. They might be joined by only one country /Iran/ by 1987. By 1987, 27 developing countries are expected to have ethylene facilities but only ten countries to have butadiene facilities. About 15 countries are expected to have facilities for the making of the other four chemicals.+ The developing countries with the most ambitious export programmes are Qatar, Libya, Saudi Arabia for ethanol and those plus Kuwait and Singapore for ethylene. Further export-oriented capacities may be expected to come onstream by 1990 in Iraq, Iran, Indonesia, the Republic of Korea, Brazil, Mexico and Venezuela. In 1990, the South may be self-sufficient by and large in basic petrochemicals.

Technology. Much of what has been said about petroleum refining holds here. There would, on the other hand, seem to be some scope for simple ethylene, propylene and methanol plants of

+ ID/WG,336/3, op. cit.

smallish output working into the domestic markets of the more sizeable developing economies. Some of them may use biogas for a feedstock. Monitoring and possibly promoting such developments would be an obvious task for UNIDO.

Other South-South cooperation. "A Programme for the Industrial Development Decade for Africa"+ and the Asean Industrial Package do not refer to non-fertiliser petrochemicals in a substantive manner. Industrial allocation schemes in the Andean Group include petrochemicals as a third priority after iron and steel and fertilisers.

Just as in the case of petroleum refining, it seems important to boost a hitherto greatly inadequate awareness of the intra-South cooperation potential in petrochemicals.

3 Fertilisers

Potash fertilisers are the products of a fairly sophisticated process of mineral beneficiation /differential dissolution or flotation/. Phosphate fertilisers are made by chemical-industry processes out of phosphate rock. Both are mineral fertilisers in the strict sense. Nitrogen fertilisers are typically made today out of natural gas or some petroleum refinery product in a petrochemical-style process.

The resource base. The distribution of potash reserves and 1978 production over the 11 UNITAD regions is shown in Figs. 7A and 7B. Reserves are abundant but very unevenly distributed, heavily biased against the South. Even so, Southern reserves could cover current Southern consumption for more than a century, and the Near East is a substantial net exporter.

The distribution of phosphate rock reserves and 1978 production over the 11 UNITAD regions is shown in Figs. 8A and 8B. Almost 60 % of the world reserve is in the Near East, but for the rest, the distribution is comparatively uniform. Only

+ UNIDO, ID/287, p. 108.

Japan is destitute, and Western Europe is poorly provided. Despite a modestish reserve position, North America is the greatest rock producer, the second greatest exporter of rock and the first exporter of phosphoric acid and phosphate fertiliser, revealing that, when reserves are abundant, production and export figures may not reflect the reserve situation at all.

The feedstocks for nitrogen fertiliser were discussed in the chapter on basic petrochemicals. The gas reserves of the Near East permit in themselves nitrogen fertiliser production far beyond any reasonable forecast of Southern needs. Making nitrogen fertiliser for intra-South distribution is one of the sensible options for using gas that is being flared today.

Trade. Figure 9 shows regional imbalances between the production and consumption of the three kinds of fertiliser for 1981/82 and 1986/87. Figure 10 shows net imports referred to internal consumption of the three kinds of fertiliser for each of the 11 UNITAD regions. The five market-economy developing regions between them expect to become practically self-sufficient in nitrogen fertiliser by 1986/87. Developing some of the immense phosphate reserves of the South to satisfy the Latin American and Asian demand is an obvious opportunity for intra-South cooperation. Intra-South trade potential in potash fertiliser appears to be slight. World movements are shown in Fig. 11.

Siting and expansion. Fifteen developing countries export phosphate rock; 39 produce and export phosphate fertiliser; 47 produce and 28 export nitrogen fertiliser; only four produce and only two /Chile and Israel/ export potash fertiliser. The fact that there are 73 developing countries with petroleum refining facilities suggests fertiliser making to be the more sophisticated operation /except in the case of potash, where the lack of viable reserves is the limiting factor/. There is some truth in this, but, more importantly, refinery products are /alas/ a more immediate liquid demand, more likely to sell under their own steam. In fact, fertiliser marketing in a developing country probably requires more sophistication than fertiliser making. /There is no immediate comparison with basic petrochemicals which are manufacturers' inputs./

Between 1981/82 and 1986/87, the South will have 44 % of the capacity increment scheduled in nitrogen, 46 % in phosphate and 37 % in potash fertiliser. These tendencies are expected to continue up to 1990 and beyond.

Technology. Urea plant construction is considered the technologically most demanding fertiliser plant building operation. Yet a good NIC firm would probably need only about a five per cent contribution from a developed-country firm to the building of one, most of which would be the basic engineering. Even that could presumably be dispensed with under a harsh delinking.

On the other hand, in both phosphate and potash mining, especially in the solution mining of potash, systems consultancy /deposit assessment, project identification, mining and beneficiation technology optimisation, optimum haulage patterns etc./ is a must for taking the right project decisions whenever international competitiveness is at stake. The expertise and international experience required therefor is probably less easy to find in even the most developed of the developing countries than factory engineering and construction expertise. Mexico seems to be the only Southern country offering such consultancy at the time of writing.

Other issues of South-South cooperation. Perhaps in no other manufacturing sphere is South-South cooperation so developed and so efficacious as in fertiliser. Regional and interregional industry associations include ADIFAL, the Asociacion para el Desarrollo de la Industria de los Fertilizantes de America Latina, AFCFP, the Arab Federation of Chemical Fertilizer Producers, ISMA, the International Phosphate Industry Association /the acronym refers to its former name, the International Superphosphate Makers' Association/, etc. Powerful country organisations such as the Fertilizer Association of India or Fertimex /ex-Guanos y Fertilizantes/ of Mexico also cultivate strong intra-South ties. Personnel from 12 other developing countries has received training in India, the main emphasis having been, significantly, on marketing and distribution logistics.+

AIP, the ASEAN Industrial Projects package involves the construction of two urea facilities, one in Indonesia and one in Malaysia, one superphosphate-ammonium sulphate fertiliser project in the Philippines, and a study on the development of potash deposits in Northeast Thailand. ++

4 Metallurgy

4.1 Iron and steel

The resource base. The distribution of world iron ore reserves and of 1978 production over the 11 UNITAD regions is shown in Figs. 12A and 12B. The reserves are sufficient for more than a millennium at 1985 forecast consumption levels. Although many developing countries have no iron ore deposits viable on even the smallest industrial scale, no developing region has an iron ore reserve problem. The best, so-called direct-reduction grade ore is less abundant, though.

The UN Statistical Yearbook lists 54 iron ore producing countries, 26 of them developing.

The distribution of coking coal reserves is uneven and biased heavily in favour of the developed regions. Further exploration may, however, improve the situation in several of the developing regions, Latin America above all. Yet the shortage of viable coking coal reserves is likely to push developing count-

+ UNIDO: Co-operation among developing countries in the fertilizer industry, ID/WG.322/1, 11 June 1980.

++ UNIDO: The Development of the ASEAN Industrial Projects, IS/281, 25 January 1982.

ries towards ironmaking technologies that require no high-grade coke /direct-reduction and charcoal ironmaking/.

In Latin America, tropical Africa and Asia in particular, there are countries whose developable or developed hydro-power resources would permit them to go in for electrometallurgy /electric steelmaking, aluminium smelting, etc./ on a fairly large scale. In the Near East, large quantities of electricity could be generated out of natural gas and refinery residues.

Misfit between phases of production. Figure 13A shows pig iron production uncovered by iron ore production in the same region, while Fig. 13B shows steel demand uncovered by steel production in the same region, for each of the 11 UNITAD regions. Japan and Western Europe are seen to depend heavily on iron ore imports; the developing regions except Latin America are seen to have steel demand uncovered by production capacity.

Technology and siting pattern. The two variables of the siting pattern are distance from tidewater and the size of the economy in GDP terms. A small land-locked economy /roughly up to an annual GDP+ of $1.5bn: Laos, Mali, Centrafrican Republic, etc./ will probably set up a few efficient all-purpose /iron-steel-non-ferrous/ foundries and a few simple but non-artisanal forges. Even these, however, may be non-profitable, utility-type facilities.

For most developing countries, mini and midi rolling mills making long products at an output as low as 20 000 tpy may make good economic sense. At the low end, a mini mill is typically scrap-fed by an electric furnace. It will probably not produce any flats /sheet, plate, coil/. A flats shop may be justified above a total mill output of 100,000 tpy. It is roughly at the GDP level of $2.5bn that a rolling mill for long products is justified. Electric steel plants integrated

+ As stated in 1980 dollars in the IBRD's World Development Report, 1982.

with a direct-reduction or charcoal pig iron making facility may be a subregional or regional affair especially if none of the countries involved is big and none has all the necessary inputs on its own. A big country like Nigeria, on the other hand, may have several such facilities.

Today, the smallest-size economy building a major integrated greenfield steelworks is Pakistan /$21.4bn/. Trinidad and Tobago /$5.3bn/ and Paraguay /$4.5bn/, on the other hand, are building mini mills, of 0.5 and 0.12 million tpy output, respectively. All greenfield mini and midi plants now being built except the Paraguayan one incorporate scrap- or direct-reduction-fed electric furnaces. Of the major greenfield plants now being built or engineered, only one is in a developed country /Canada/. The other 12 are in NICs or NICs-to-be: their total initial capacity is to be 28.5 million tpy in crude steel terms.

There is no sharp boundary between the major steelworks of the developed and the developing countries. In 1980, five of the 50 biggest steel producers of the world were in NICs /Brazil, Republic of Korea, Argentina, India and Venezuela/. Developing-country steelmakers will be eager to find markets in the developing world too: their works sited on tidewater will export rolled steel, whereas the inland works of major economies like Bhilai or Bokaro in India will supply engineering industries aggressive as to marketing policy.

Trade. Interregional iron and steel movements are shown in Fig. 14. Of total Southern steel imports in 1976, the share of South-South trade was 12 % for long products, 2.8 % for flats, 9 % for wire, 8 % for tubes and pipe and 7.5 for iron and steel structures.+ The figure for flats is quite outstandingly low among all the items of South-South trade. By and large, most imports of longs could be replaced by deliveries out of strategically placed domestic or subregional mini or midi rolling mills. Flats

+ TD/B/C.7/36/Add.3, op. cit. In the source, Rumania, Turkey and Yugoslavia figure as developing countries.

would require more of a regional or interregional approach.

Other issues of South-South cooperation. As far as the documents available at the time of writing reveal, South-South cooperation in iron and steel beyond simple trade is in the stage of very preliminary enquiries only.

4.2 Non-ferrous metallurgy

Figure 15 shows interregional non-ferrous metals movements. Figure 16 shows the regional differences between the production and consumption of the five non-ferrous metals discussed here, aluminium, copper, lead and zinc, and tin.

4.2.1 Aluminium

The resource base. Figure 17 shows the distribution of bauxite reserves, bauxite, alumina and aluminium production over the 11 UNITAD regions. Tropical Africa and Latin America between them possess more than 60 % of world reserves, but Australia is rich enough to satisfy all Northern needs at a pinch. Cheap unused sources of electricity for aluminium smelting are confined to the South, more or less /cf. the chapter on iron and steel/.

Siting and technology. Economies of scale in the aluminium smelter business are considerable, and even more so in alumina making and in bauxite mining. Viable export-oriented smelters and alumina plants today are of 0.1 to 0.5 million and 0.5 to 2.5 million tpy size, respectively. No mini alumina plant or smelter is in sight. Even in a big economic community of subregional or regional scale, facilities must be at least partially export-oriented if they are to profit fully by the economies of scale available.

Trade. The South's smelter capacity, small as it is, can almost satisfy Southern aluminium demand /in fact, with Other Asia disregarded, the South has a surplus/. The problem is that, for reasons of smelter ownership, most of the metal produced in the South is taken North, and the metal consumed in the South has its origin in the North. In 1976, only 23 per cent of the aluminium semis imported by the South came from Southern sources.+ Short-circuiting the trade flows that pass through the North is a viable opportunity for South-South cooperation. It could involve about 100,000 tons of semis and as much metal again or more a year.

Other South-South cooperation. IBA, the International Bauxite Association, provides the right sort of institutional background therefor: so far, however, such cooperation beyond simple trade is in the pre-feasibility study stage at best. A UNIDO-sponsored study into an Indian-Mozambican project is a case in point.

4.2.2 Copper, lead and zinc

Ever since the early 19th century it has been usual to smelt these metals in their bulk next to their respective mines, with comparatively little ore concentrate entering international trade. Moreover, many mines produce two or all three of these metals. Accordingly, 47 % of copper smelting capacity is in the South, as against 12 % for aluminium. The corresponding figures are only 22 and 14 % respectively for lead and zinc, but that is because the bulk of these two metals is mined in the North.

The distribution of the reserves, mine, smelter and refinery capacities over the 11 UNITAD regions is shown in Fig. 18 for copper and in Fig. 19 for lead; the same for zinc reserves, mine and primary metal production is shown in Fig. 20.

+ TD/B/C.7/36/Add.3, op. cit.

The resource base. The Americas are outstandingly rich in copper; the distribution over the other regions is fairly even. This in itself queries the viability of a CIPEC /Conseil International des Pays Exportateurs de Cuivre/ operating as a cartel; to work, it would require substantial Northern backing. Lead and zinc are often mined together. Northern reserves of both are predominant, but Latin America has enough to satisfy the South's rather modest needs at a pinch.

Siting and expansion. Mine and smelter expansion is tied up with the availability of viable ore deposits. On the other hand, whereas some of the refining of these metals does take place next to the smelters, a fair amount of unrefined metal enters international trade in the South to North direction. The stage with the greatest value added, semifabrication, is predominantly Northern, although countries like Chile have been building and expanding semis capacities recently. To avoid tariff barriers that are much higher against the semis than against the metals, some developing countries have embarked upon joint semis ventures in the North /e.g. Zambia and Chile in Western Europe+/.

Of the 6 million tpy of copper refining capacity to be built between 1975 and 1990, 1.15 million tpy is to be in Latin America, one million tpy in Tropical Africa and the Near East, and the bulk of the rest in the North; additions in the Asiatic sphere are not expected to be significant. Of the 4 million tpy of slab zinc capacity and of the 3 million tpy or so of lead refining capacity to be built in the world between 1975 and 1990, only about 0.8 and 0.6 million tpy is forecast to be sited in the South as a whole. Even this pattern reflects the reserve distribution, by and large: investment is in fact attracted by the biggest and most viable ore deposits. There is, however, no denying the fact that, in recent times, the miners and refiners

+ UNIDO: Mineral Processing in Developing Countries, ID/253, op. cit.

of these metals have tended to withdraw into the North. Southern cooperation in prospecting for these ores and in developing their viable deposits is therefore to be recommended.

Trade. With reference to Fig. 16, the South has a deficit in zinc, a minor surplus in lead and a major one in copper. There is a considerable scope for short-circuiting trade flows passing through the North in copper, whereas in lead and zinc the effort does not seem to be rewarding.

4.2.3 Tin

In comparison with the other metals, tin is a minor commodity. What makes it remarkable is the long-standing and comparatively efficacious International Tin Agreement and, in another aspect, the takeover of the Southeast Asian deposits by the owner countries and the successful development of a tin smelting industry which, by straightforward input starvation, has practically put an end to the smelting and refining of Southeast Asian concentrate in Britain or anywhere in the North.

The resource base. World zinc reserve, mine and primary metal production distribution over the 11 UNITAD regions is shown in Fig. 21. The reserve distribution is a fairly biased one, with the principal concentration in Asia. The North is not self-sufficient. The life of what are considered viable deposits today is running out.

Siting and expansion. The situation is much the same as for copper, lead and zinc. The expected smelter capacity addition is about 80,000 tpy between 1975 and 1990. The greatest part is to be where the reserves are, in Southeast Asia, Latin America and Australia. Yet Japan is the only region where the capacity is to be actually reduced.

Trade. Every Southern region except the Indian one is a net exporter. In contrast, every Northern region except the Other Developed group /thanks to Australia/ has a deficit. Significantly, about 80 % of the tin and tin alloys imported into the Southern regions comes from Southern countries.+

4.3 Non-ferrous metals - general

Other South-South cooperation. The two producers' associations, IBA and CIPEC /see above/ come to mind first. Although not confined to Southern countries /Australia e.g. is a member of both/, they certainly were Southern initiatives. Their principal striving is to safeguard prices, but they provide the right institutional background for future cooperation in metallurgy too. The International Tin Agreement /ITA/ as a producer-consumer body is perhaps less suited for such ends: in any case, tin, apart from petroleum, seems to be the mineral in which Southern predominance is strongest.

Cooperation in fabrication, as exemplified by the negotiations now underway between Zambia and Egypt on the one hand and Zambia and Nigeria on the other seems to be one of the most suitable strategies for expanding the market potential of Southern non-ferrous metals in the South.

Availability of metallurgical technology in the South. "Metallurgical Plantmakers of the World"++ lists 89 metallurgical plantmakers in the South, all except three in the NICs. Many of these plantmakers have association agreements with Northern companies which give them access to the most modern advances in technology. Mexico's proprietary HyL direct reduction process has attracted a great deal of interest. Indian metallurgical plant is on offer in a broad range of Southern countries. Dastur GmbH is the branch in the FRG of a renowned Indian metallurgical engineering company, a UNIDO consultant.

+ TD/B/C.7/36/Add.3, op. cit.

++ Metal Bulletin, ed. Richard Serjeantson, Second edition, 1981.

5 Some general considerations

Tariff barriers. Tariffs of entry into the countries of the North of most mineral-based commodities tend to increase, sometimes steeply, as the degree of processing of those increases. Zero percent on copper concentrates, 7 % on unwrought copper and 23 % on wrought copper in Japan is striking but not unusual. The general situation is the same for other metals in other countries.[&]

Similarly, there is a considerable tariff differential in petrochemicals between the basic and the more processed products: most basics are duty-free in most Northern countries, whereas intermediates carry a duty of about 10 % on average.[£]

The implication is that, as far as the comparatively modest markets of the South permit, a system of GTSP /Global System of Trade Preferences among Developing Countries/ could give a major boost to the setting up of facilities of higher processing of minerals-based commodities in the South.

Splitting the benefits of South-South trade. Dismantling tariff barriers and liberalising trade may entail losses of financial earnings as a major problem and may hinder thereby further trade liberalisation.

Who in the South should do the higher processing of minerals? A fertiliser plant e.g. may be set up in the consumer country as well as in the country which produces the fertiliser mineral. What balance should be struck between the two? This issue may become just as controversial in the South-South relation as it is today in the North-South relation.

What can Southern countries offer in exchange for the goods that they buy from other Southern countries? The richer countries of the South with their comparatively large and developed economies will have no serious difficulty finding the right sort of complementarities between them, but the poorest Southern countries, whose lack of endowments is an obstacle to a more intensive integration into any sort of world or regional /or indeed subregional/ economy, are liable to have

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& For details cf. UNIDO, ID/253, op. cit., p. 100.

£ For details cf. UNIDO, ID/WG.336/3, op. cit.

much the same difficulties fitting into a "Southern world economy". Let us recall that much of the indebtedness of these countries is due to the high price of petroleum and petroleum products, essentially an intra-South trade flow.

It would thus seem as though much of the benefits of South-South cooperation were liable to be short-circuited among the most well-off countries of the South, such as the NICs and capital-surplus OPEC.

Technology. According to UNIDO's First Global Study on the Capital Goods Industry (ID/WG.342/3), capital goods for the chemical and petrochemical industries are level-3 and level-4 and those for heavy metallurgy are level-4 in a six-level ranking from hand tools to twin-engined jet aircraft. There are about nine Southern countries /India, Brazil, Argentina, the Republic of Korea, Mexico, Egypt, Hong Kong, Singapore and China/ which can manufacture this type of equipment except for the most sophisticated components such as instrumentation, telemetering, control and automation, catalysis and catalysts, high-performance compressors, some process pumps and turbines.

There are further 15 developing countries or so with what may be called embryonic capital-goods industries. These can do construction and structurals and much of the boilerwork for the industries considered here.

Even though the capital goods industries of these countries do have idle capacities, however, they would certainly not be able to replace out of hand even a major share of the capital goods flows from the North into the South, let alone all of it. There is thus a volume-wise as well as a sophistication-wise limitation to what they can do.

In a situation of harsh delinking, the industries of the NICs and of some other Southern countries would probably find themselves able to turn out certain volumes of workable complete plants for each of the industries considered here. The underlying dialectic of the above assumption is that, the more de-linking there is, the less would the capital goods or the complete plant made in the South and the products coming out of such plant be competitive with those of the North; but them, the less would competitiveness with the North matter; the whole set of criteria of competition would shift so as to accommodate the goods that are in fact available.

In any other situation than harsh delinking, the comparative advantages/disadvantages of the developing-country suppliers will depend /a/ on the availability of consultancy services, of the fruits of ongoing innovation and of the most sophisticated items and components that go into complete plant: a gradual reduction of dependence as opposed to simply cutting loose from the North should be the watchword there; and /b/ on the capability or otherwise of Southern suppliers to provide supplier-credit backing to their deliveries. As an enhanced North-North-South-South cooperation would imply enhanced finance flows from the North to the South among many other things, predicated on the assumption that these flows would result in expanded purchases of capital and other goods by the South in the North, such a cooperation scenario would not in itself be beneficial to enhanced intra-South cooperation in the setting up /or in the running/ of the industries considered here.

Manpower. All the industries considered here are comparatively skill-intensive even in a developed-country context. Providing them with adequate manpower is a problem even in the more sophisticated developing countries. Training is therefore a key issue of developing these industries in the South. The training of one Southern country's national personnel in some other Southern country, especially in fertiliser but in petroleum refining and metallurgy also to some extent, has been fairly successful even so far and should be encouraged and expanded.

Movement of labour intra-South so far has been largely from North Africa and South Asia into the Arab Gulf: in 1979, it generated expatriates' remittances to the tune of about $10bn. While such movements do benefit the host country, they are no boon to the country of origin: there are the makings of an intra-South brain drain phenomenon here.

List of figures

Fig. 6. Polymerisation etc. products, SITC code 583 /revised/. Net interregional trade flows among market-economy regions, $ million, 1980. Flows worth less than $10 million and intra-regional flows not shown. Source as in Fig. 4, pp. 1014-1015; cf. also the caption to Fig. 4.

Fig. 7. Percentage distribution of A - world potash reserves and B - world potash production, 1978, over the 11 UNITAD regions. The percentages not shown are: A - 0.7 % for LA, 0.2 % for TA, 1.3 % for AS and 1.1 % for OA; B - 0.1 % for LA and 0.6 % for OA. Source: US Bureau of Mines Bulletin 671, Mineral Facts and Problems, 1980.

Fig. 8. Percentage distribution of A - world phosphate reserves and B - world phosphate rock production, 1978, over the 11 UNITAD regions. The percentages not shown are: A - 1.0 % for TA, 0.3 % for IN and 0.3 % for AS; B - 1.3 % for LA. Source as in Fig. 7.

Fig. 9. Regional imbalances, production minus consumption, million tons, of the three principal fertiliser types, in terms of the active ingredient N, P_2O_5 and K_2O, in the crop years 1981/82 /fact/ and 1986/87 /forecast/. D - statistical difference; ND - net deficit of the South. Source: A World Bank draft dated Sep 2, 1982 of FAO's Current World Fertilizer Situation and Outlook, 1981/82 - 1986/87.

Fig. 10. Net imports as a percentage of intra-regional consumption in the 11 UNITAD regions of the three principal fertiliser types, in terms of the active ingredient N, P_2O_5 and K_2O, crop year 1979/1980. A column on the minus side means that the region is a net exporter. Source: FAO, Fertilizer Yearbook, 1980, Vol. 30, Rome 1981. FAO Statistics Series No. 36.

Fig. 11. Manufactured fertilisers, SITC code 562 /revised/. Net interregional trade flows among market-economy regions,

$ million, 1980. Flows worth less than $12.5 million and intra-regional flows not shown. Source as in Fig. 4; pp. 1008-1009. Cf. also the caption to Fig. 4.

Fig. 12. Percentage distribution of A - world iron ore reserves and B - world iron ore production, 1978, over the 11 UNITAD regions. Source: US Bureau of Mines Bulletin 671, Mineral Facts and Problems, 1980.

Fig. 13. A - pig iron production uncovered by iron ore production and B - steel demand uncovered by steel production for each of the 11 UNITAD regions, million tons per year. D - statistical difference. An above-line column indicates, in A, that the region is a net exporter of iron ore; in B, that the region is a net exporter of steel. Source: Author's calculations based on various sources.

Fig. 14. Iron and steel, SITC code 67 /revised/. Net interregional trade flows, $ million, 1979. Flows worth less than $200 million and intra-regional flows not shown. Source: UN: 1980 Yearbook of International Trade Statistics, Vol. I, ST/ESA/STAT/SER.G/29, pp. 1150-1155. Does not include exports by the USSR that could not be attributed by destination. Cf. also the caption to Fig. 4.

Fig. 15. Non-ferrous metals, SITC code 68 /revised/. Net interregional trade flows, $ million, 1979. Flows worth less than $100 million and intra-regional flows not shown. Source: as in Fig. 14; pp. 1154-1159. Cf. also the caption to Fig. 4.

Fig. 16. Regional imbalances, production minus consumption, thousand tons, of the five "older major /non-ferrous/ metals", 1979. D - statistical difference; ND - net deficit of the South; NS - net surplus of the South. Columns above the line mean that the region is a net exporter. Source: Metallgesellschaft Aktiengesellschaft, Metal Statistics 1969-1979, 67th Edition, Frankfurt am Main, 1980.

Fig. 17. Percentage distribution of A - world bauxite reserves, B - world bauxite production, C - world alumina production, D - world aluminium production in 1978 over the 11 UNITAD regions. The percentages not shown are: A - 0.2 % for NA, 0.7 % for OA; B - 2.1 % for NA; C - 1.7 % for IN, and D - 0.7 % for NE and 1.5 % for IN. Source: as in Fig. 12.

Fig. 18. Percentage distribution of A - world copper reserves, B - world mine production of copper, C - world smelter and D - world refinery production of copper in 1978 over seven world regions. AF includes South Africa, Tropical Africa and Mediterranean Africa. OC includes both developing and developed Oceania. AS includes Asia, the Indian region and Japan. NE means the Near East in the strict sense, up to and including Iran. The other symbols are used as for the UNITAD regions. Source: as in Fig. 12.

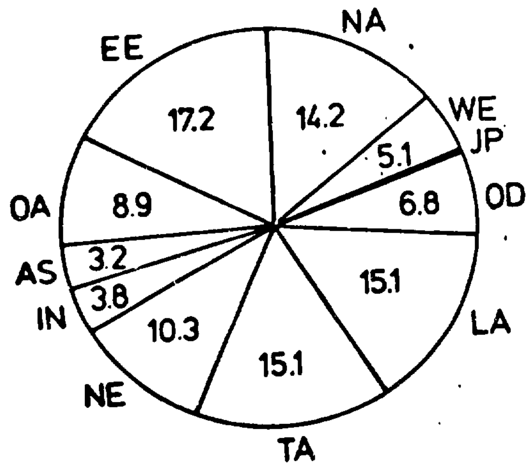
Fig. 19. Percentage distribution of A - world lead reserves, B - world mine production, C - world smelter and D - world refinery production of lead in 1978 over the 11 UNITAD regions. The percentages not shown are: C - 0.8 % for NE and 0.7 % for IN+AS; D - 0.8 % for NE and 1.3 % for IN+AS. Source: as in Fig. 12.

Fig. 20. Percentage distribution of A - world zinc reserves, B - world zinc mine production and C - world primary zinc production in 1978 over the 11 UNITAD regions. The percentages not shown are: A - 1.9 % for IN; B - 0.5 % for NE and 1.7 % for IN; C - 1.5 % for TA, 2.2 % for NE, 2.1 % for IN and 1.1 % for AS. Source: as in Fig. 12.

Fig. 21. Percentage distribution of A - world tin reserves, B - world tin mine production and C - world tin smelter production in 1978 over the 11 UNITAD regions. The

figures not shown are: A - 0. 7 % for NA; B - 0.2 % for NA, 1.6 % for WE and 0.2 % for JP. Source: as in Fig. 12.

Fig. 1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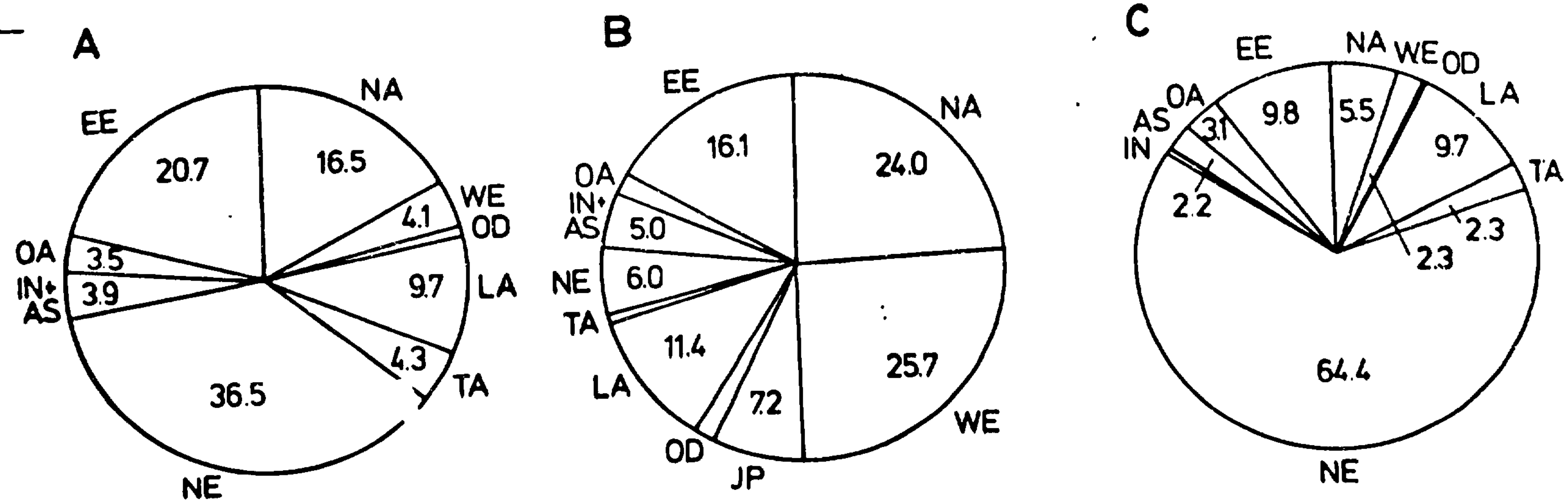
TA
15.1
LA

Fig. 2.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B
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16.1
NA
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5.0
NE
6.0
TA
11.4
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25.7
WE
7.2
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JP
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64.4
NE

Fig. 3

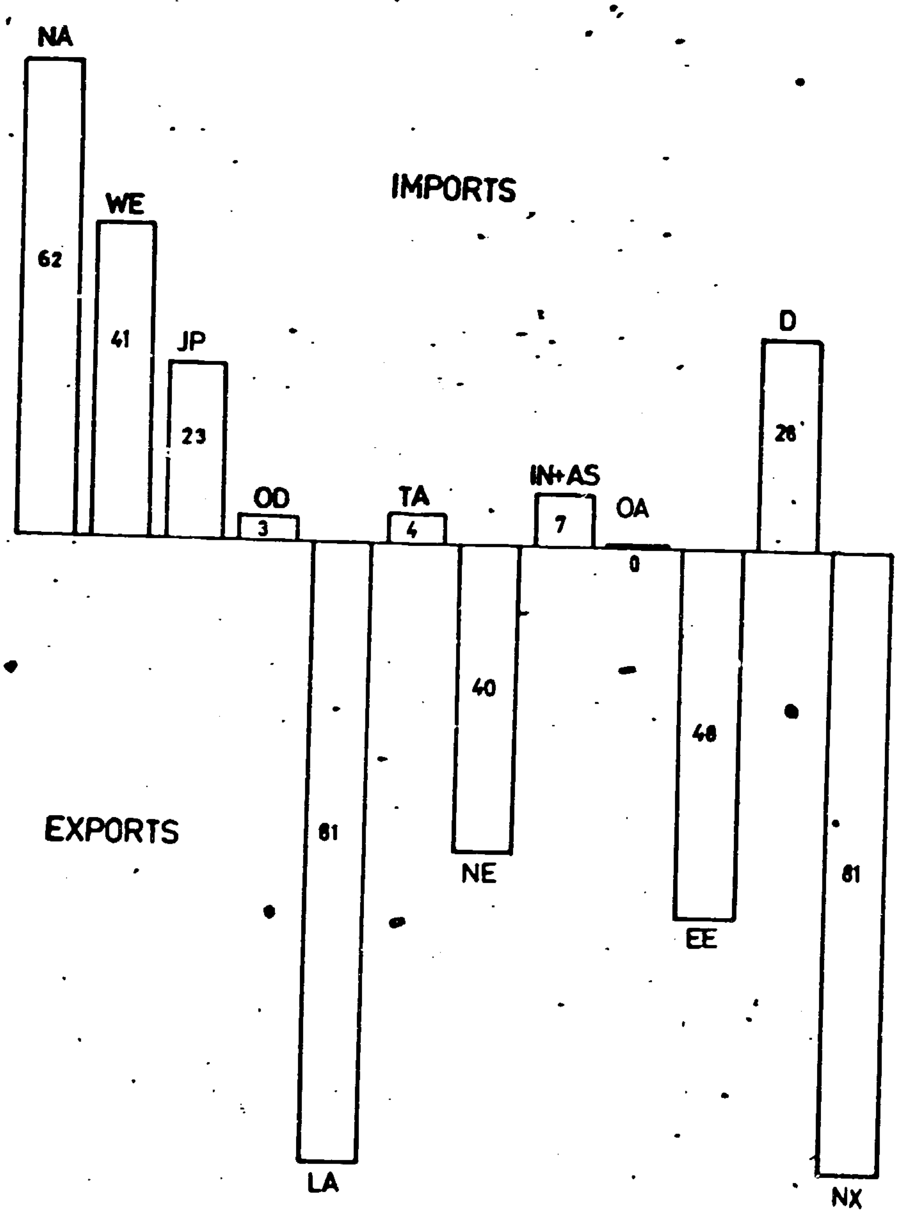

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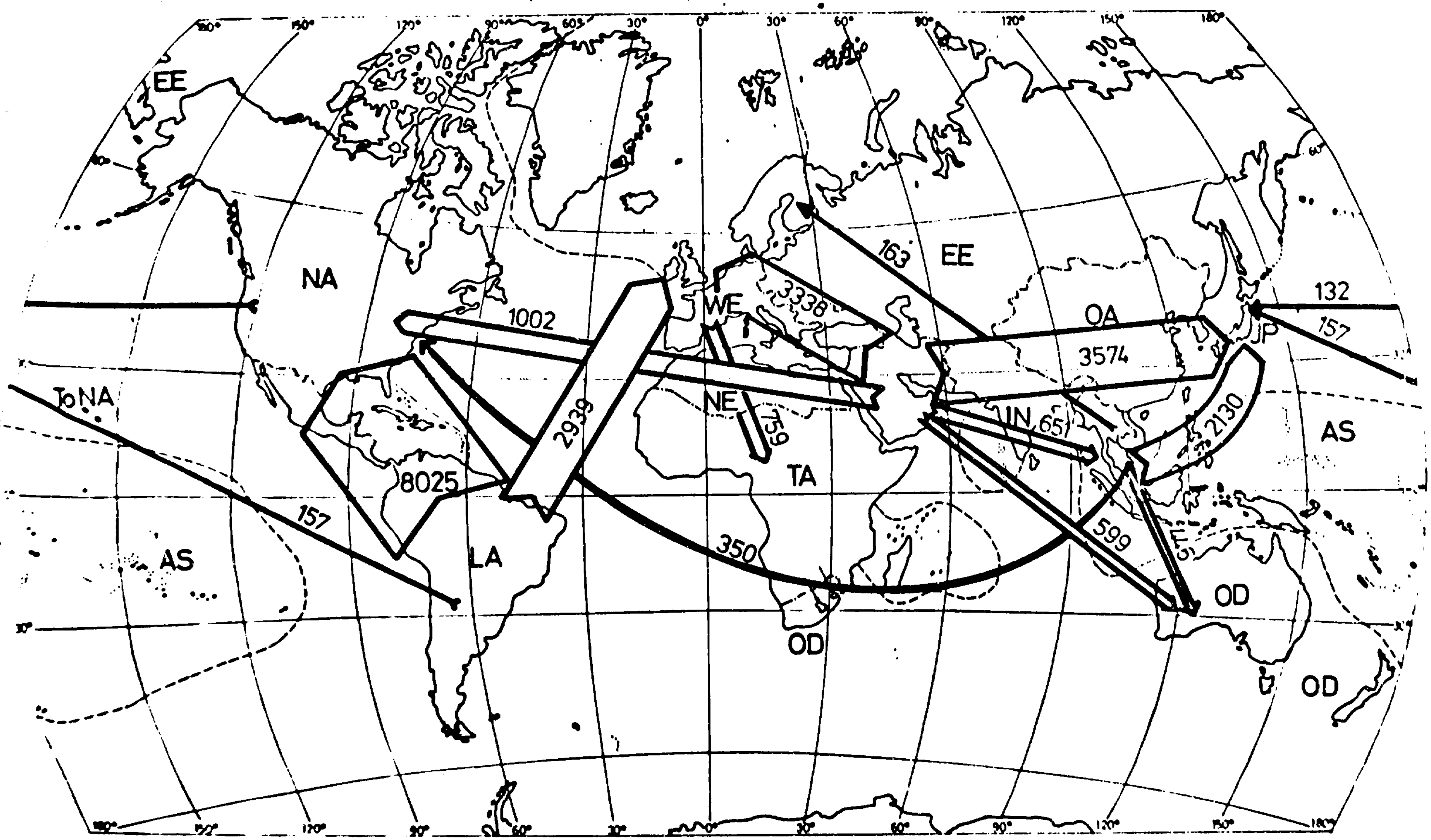
Fig. 4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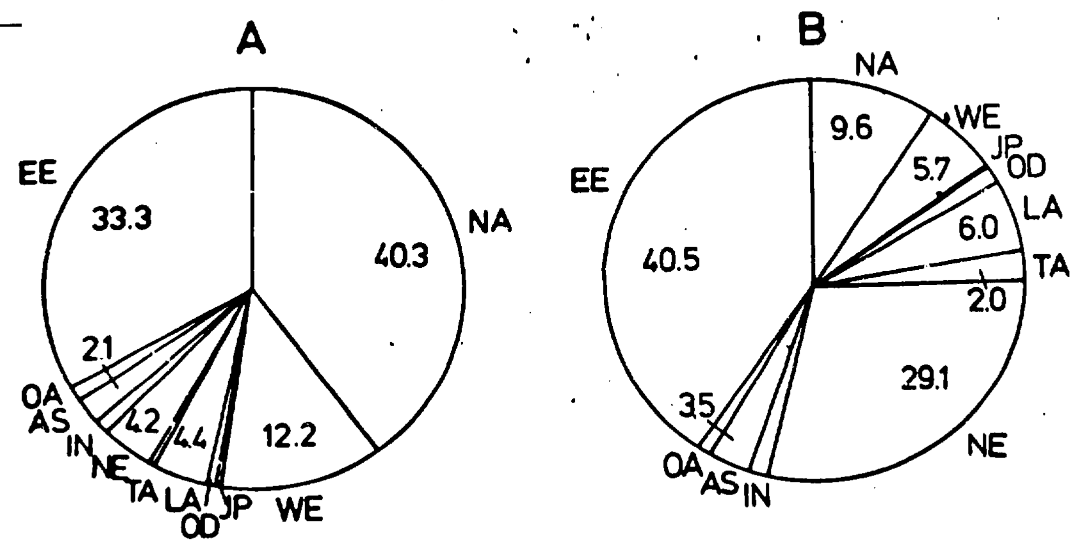
To NA
157
AS

Fig. 5



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B
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9.6
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OA
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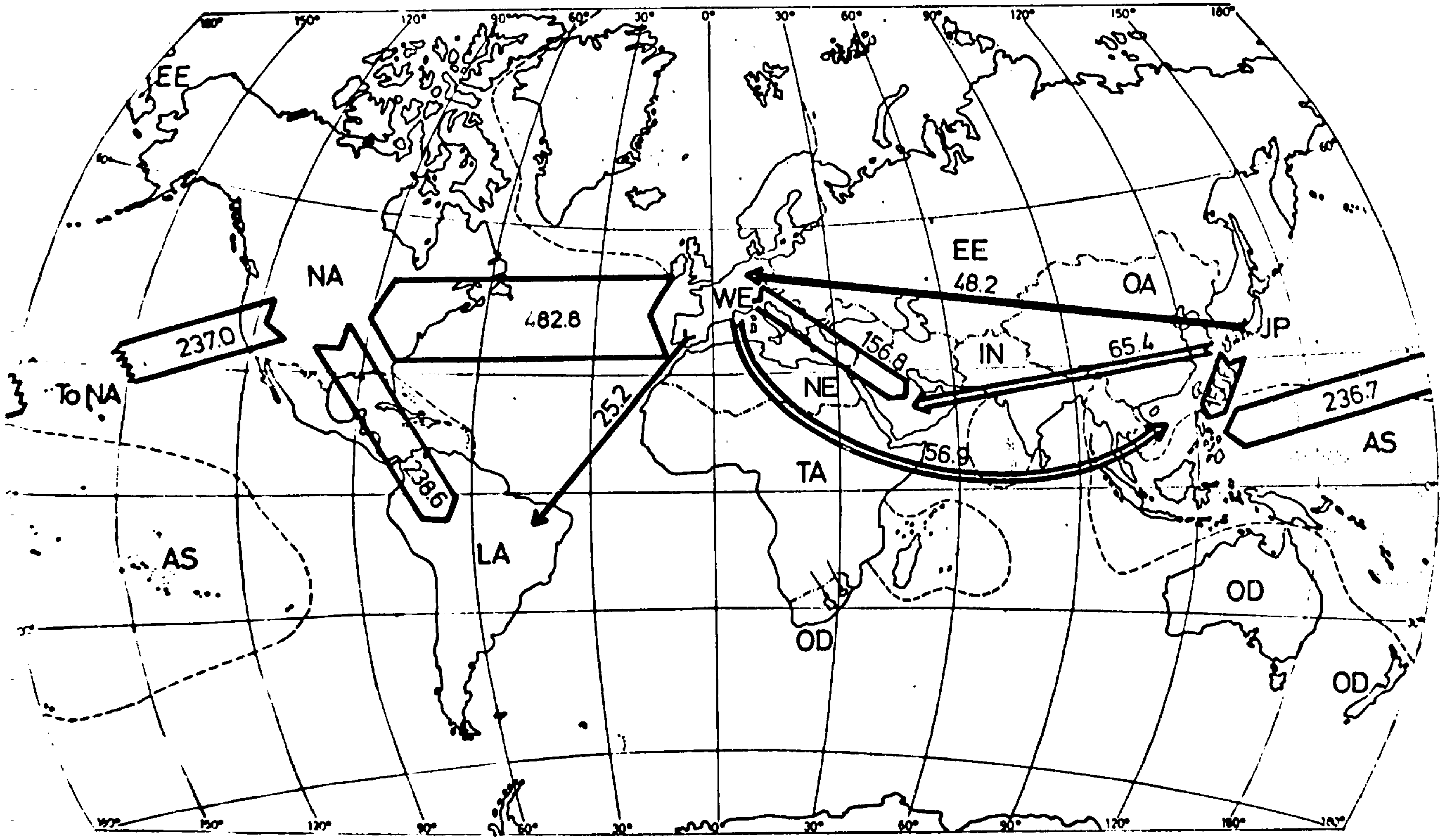
IN

Fig. 6.



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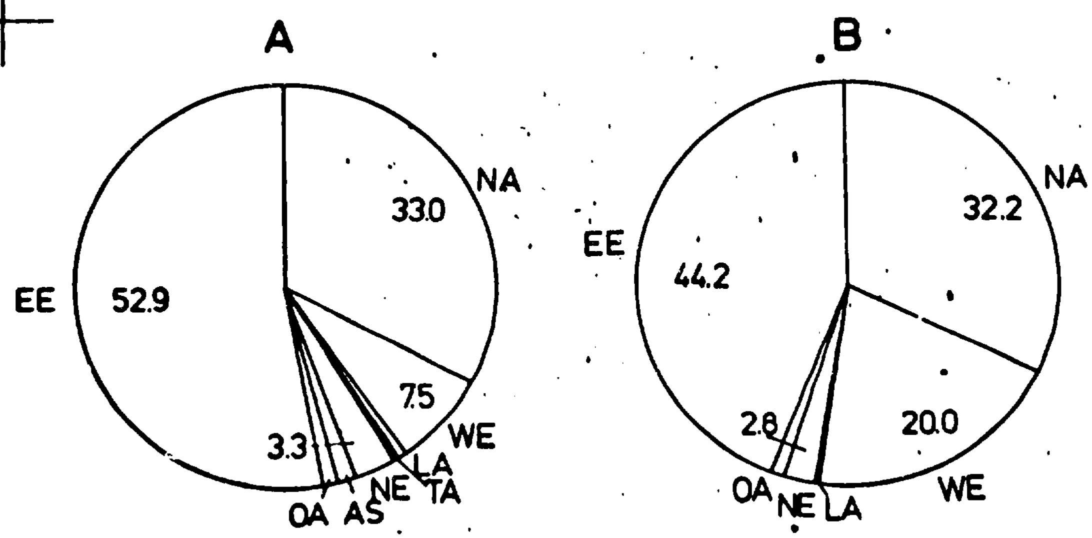
OD

Fig. 7



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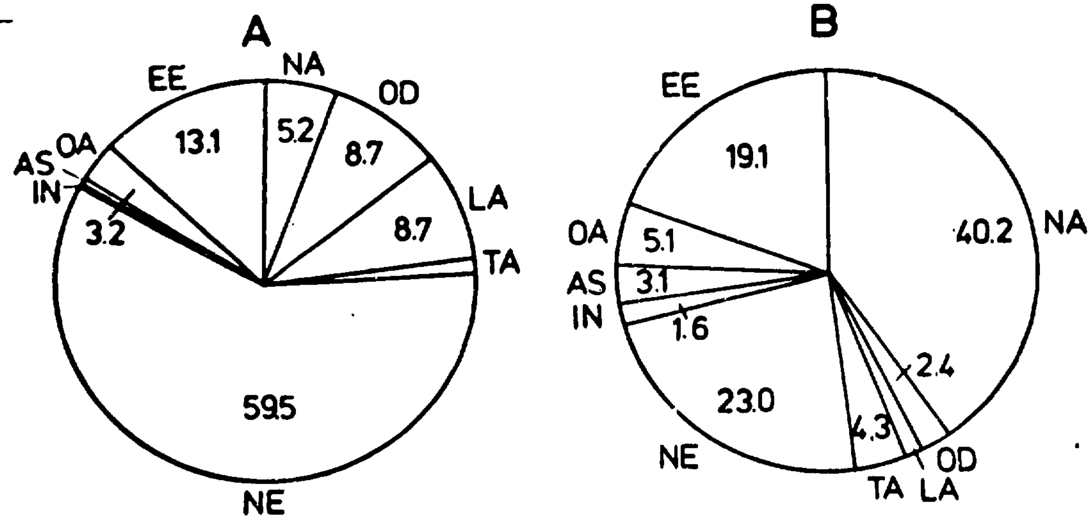
LA
WE

Fig. 8



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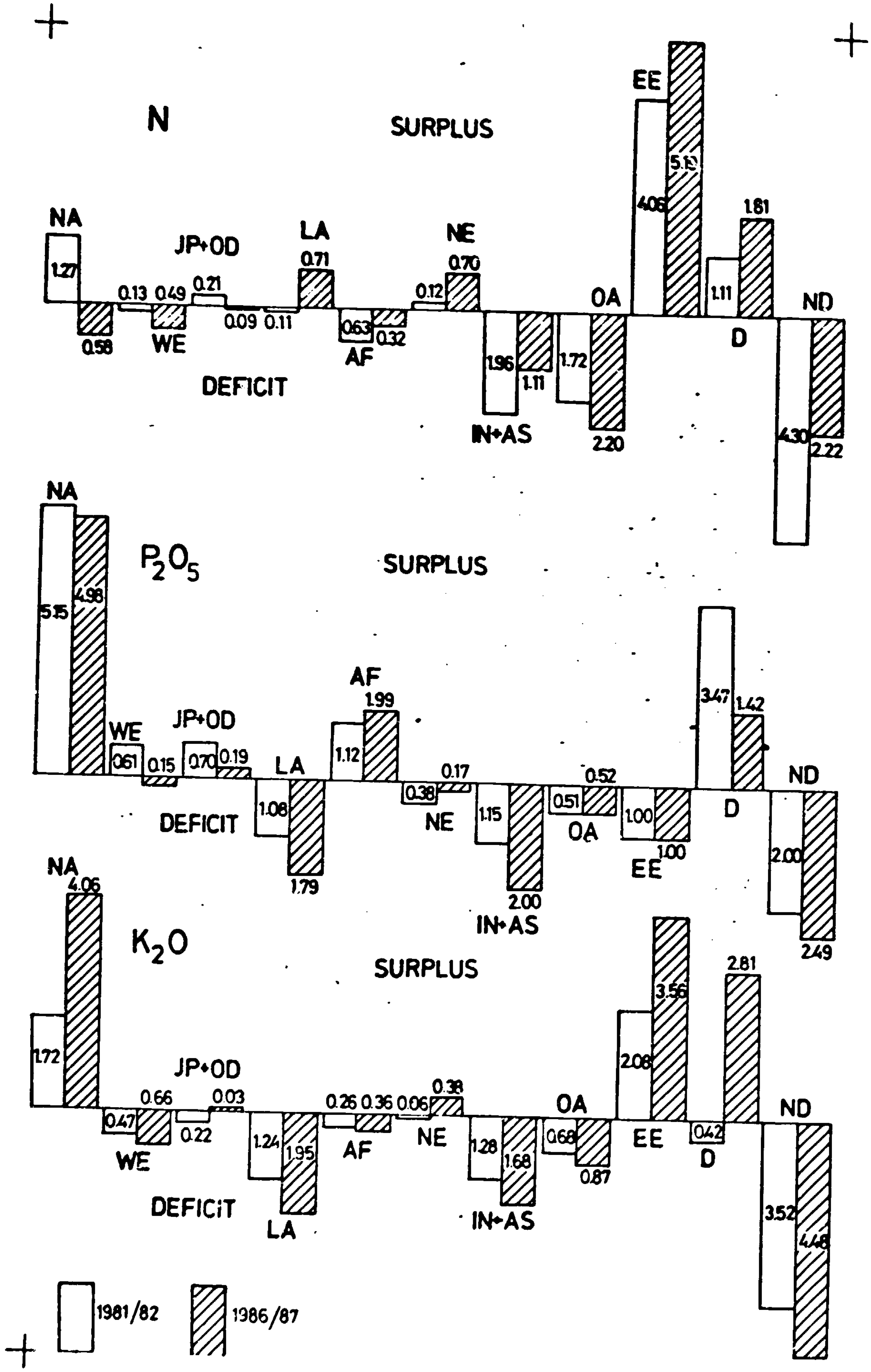
NE
OD
TA
LA

Fig. 9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EE 4.06 5.10
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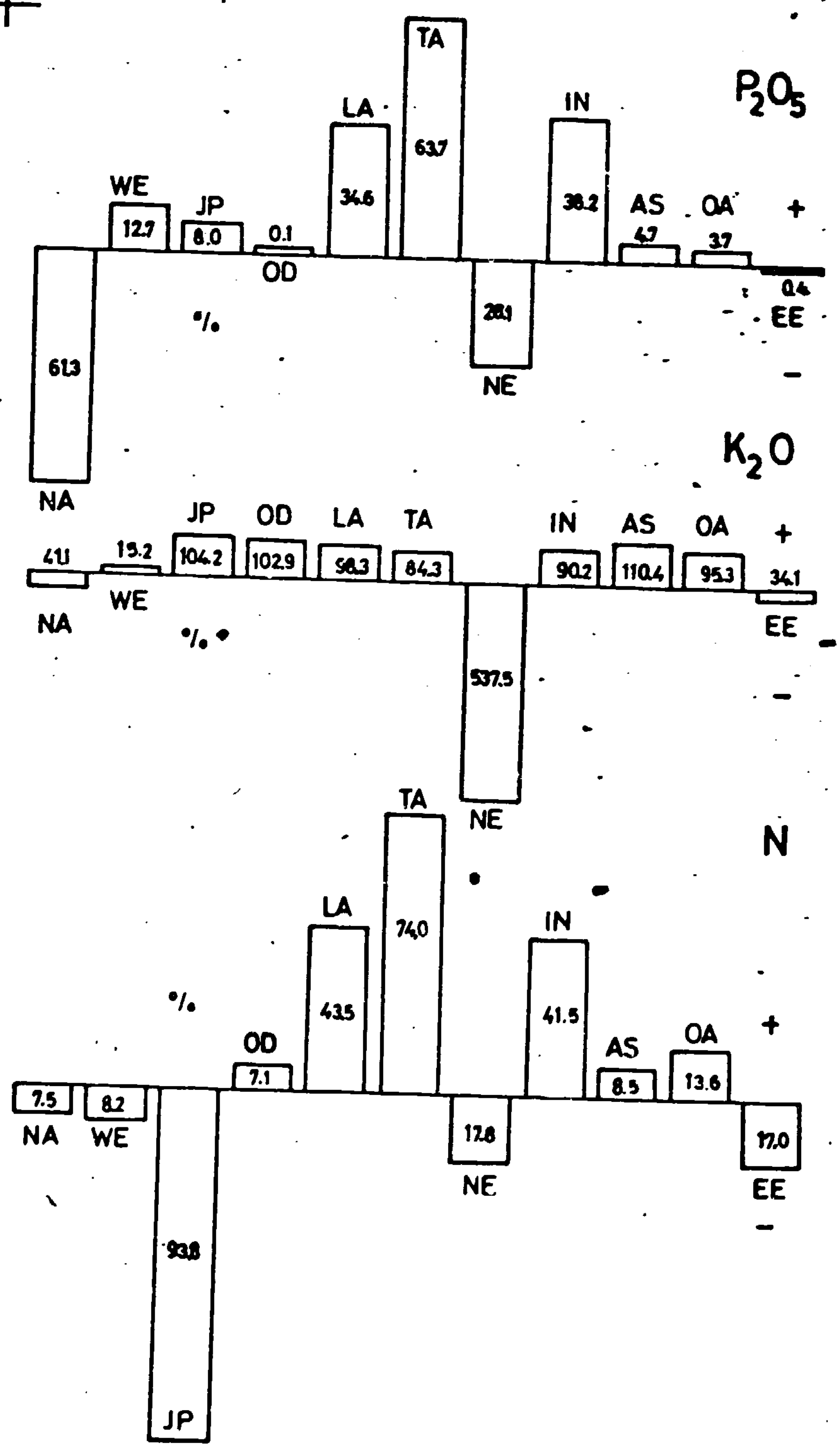
1981/82
1986/87

Fig. 10



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OA
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EE
+
−
%
K2O
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+
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%
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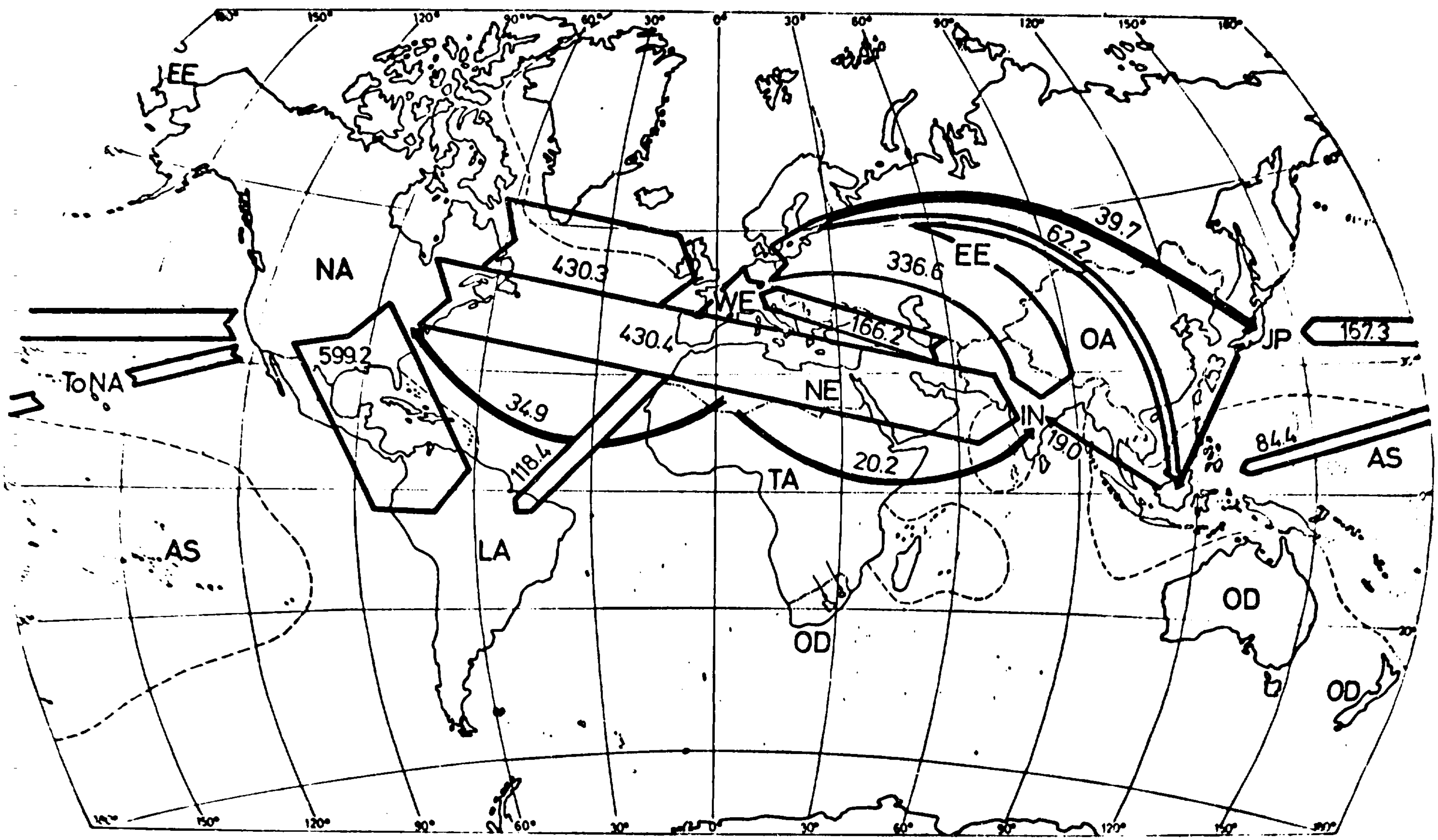
Fig. 11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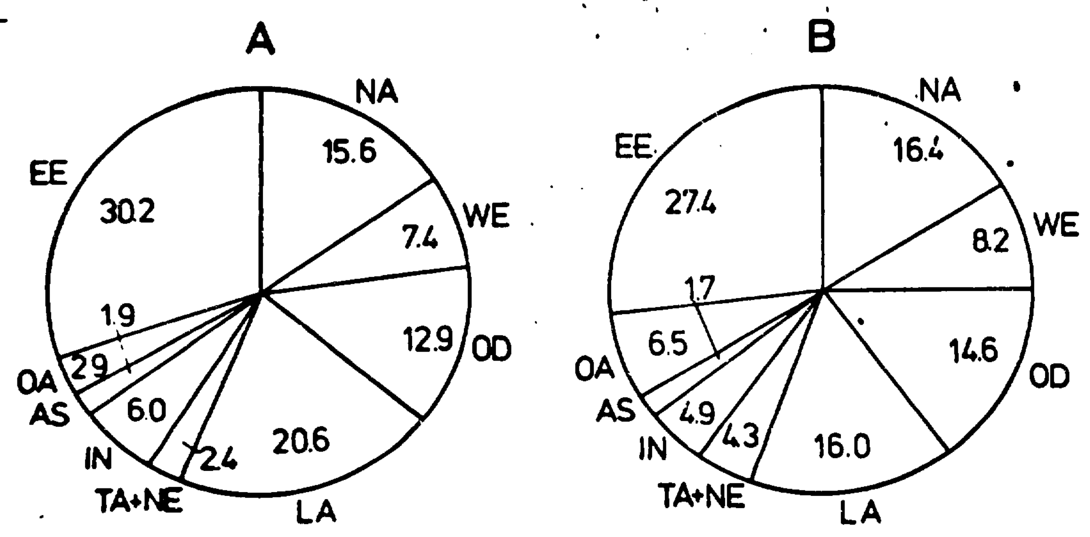
OD
OD

Fig. 12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WE
8.2
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EE
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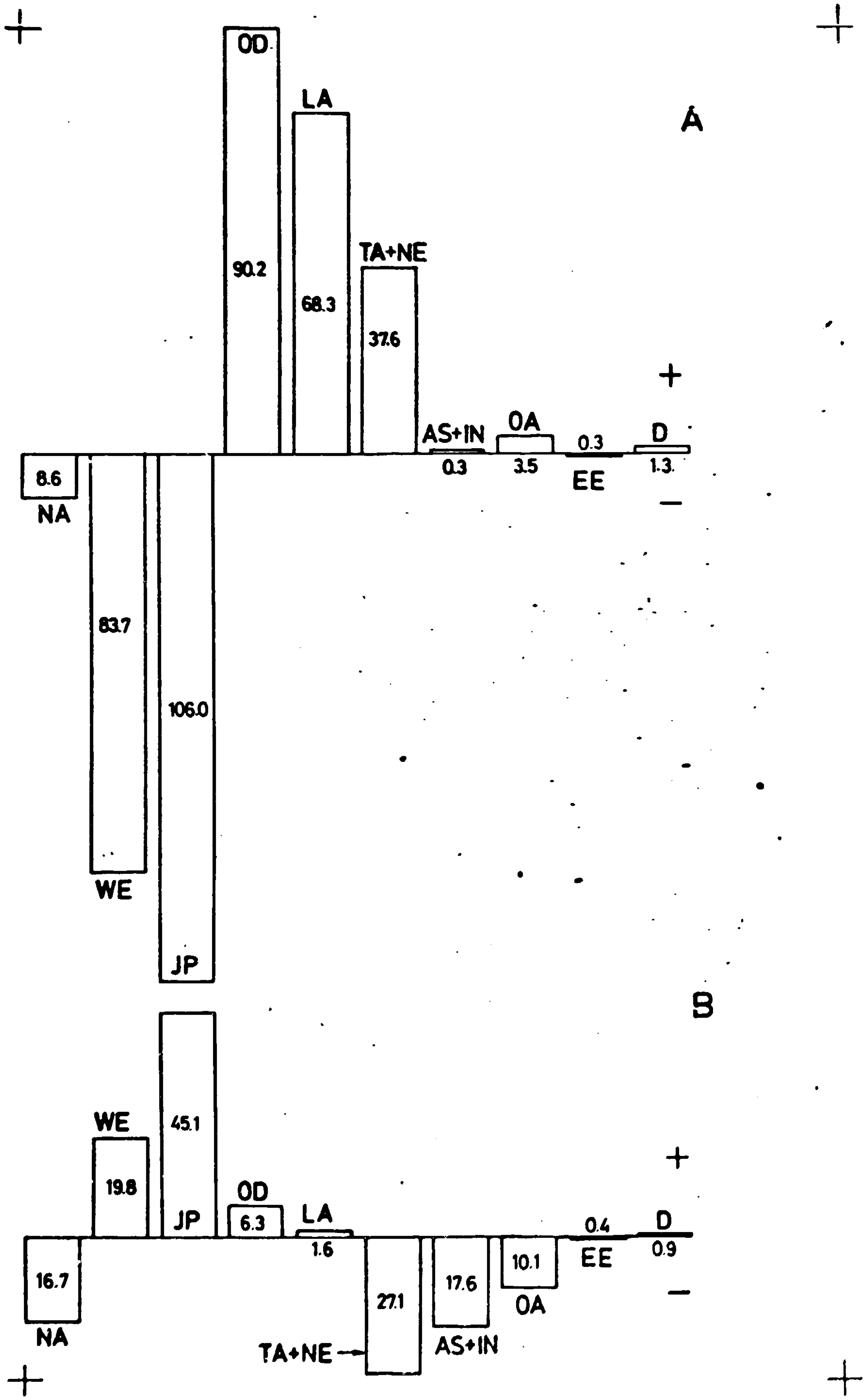
Fig. 13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WE
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JP
+
−
B
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19.8
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JP
OD
6.3
LA
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AS+IN
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OA
+
−

Fig. 14

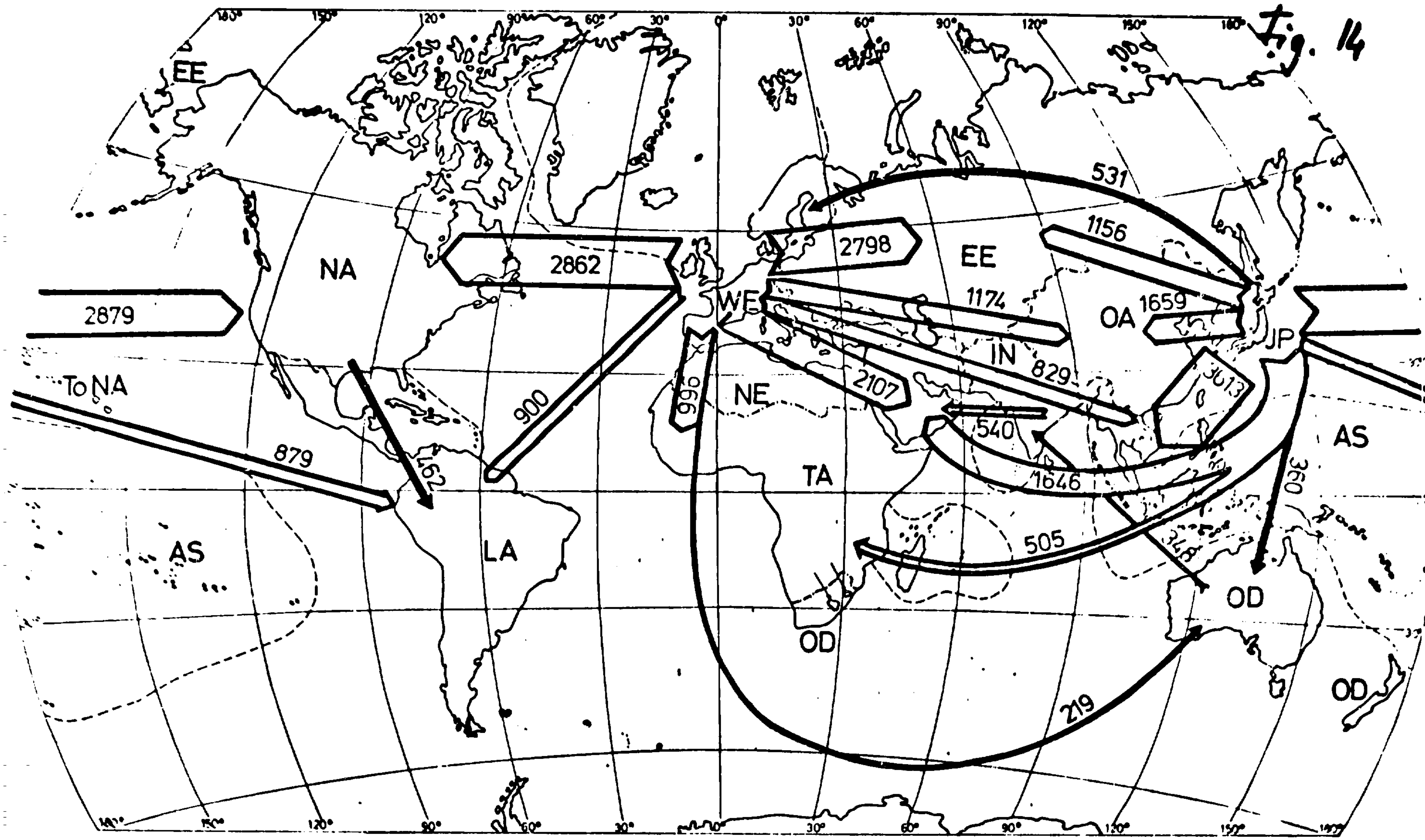
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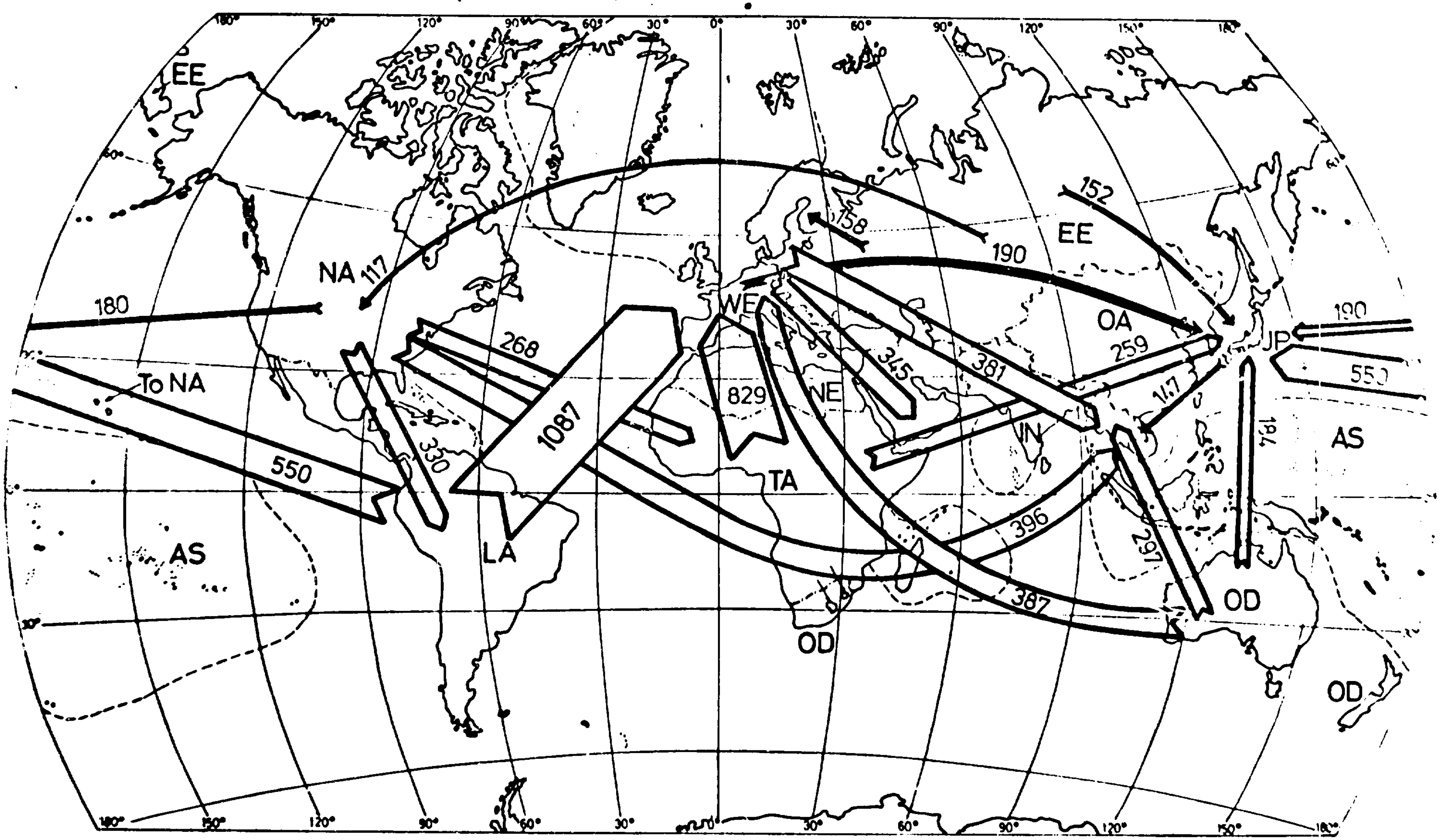
Fig. 5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AS
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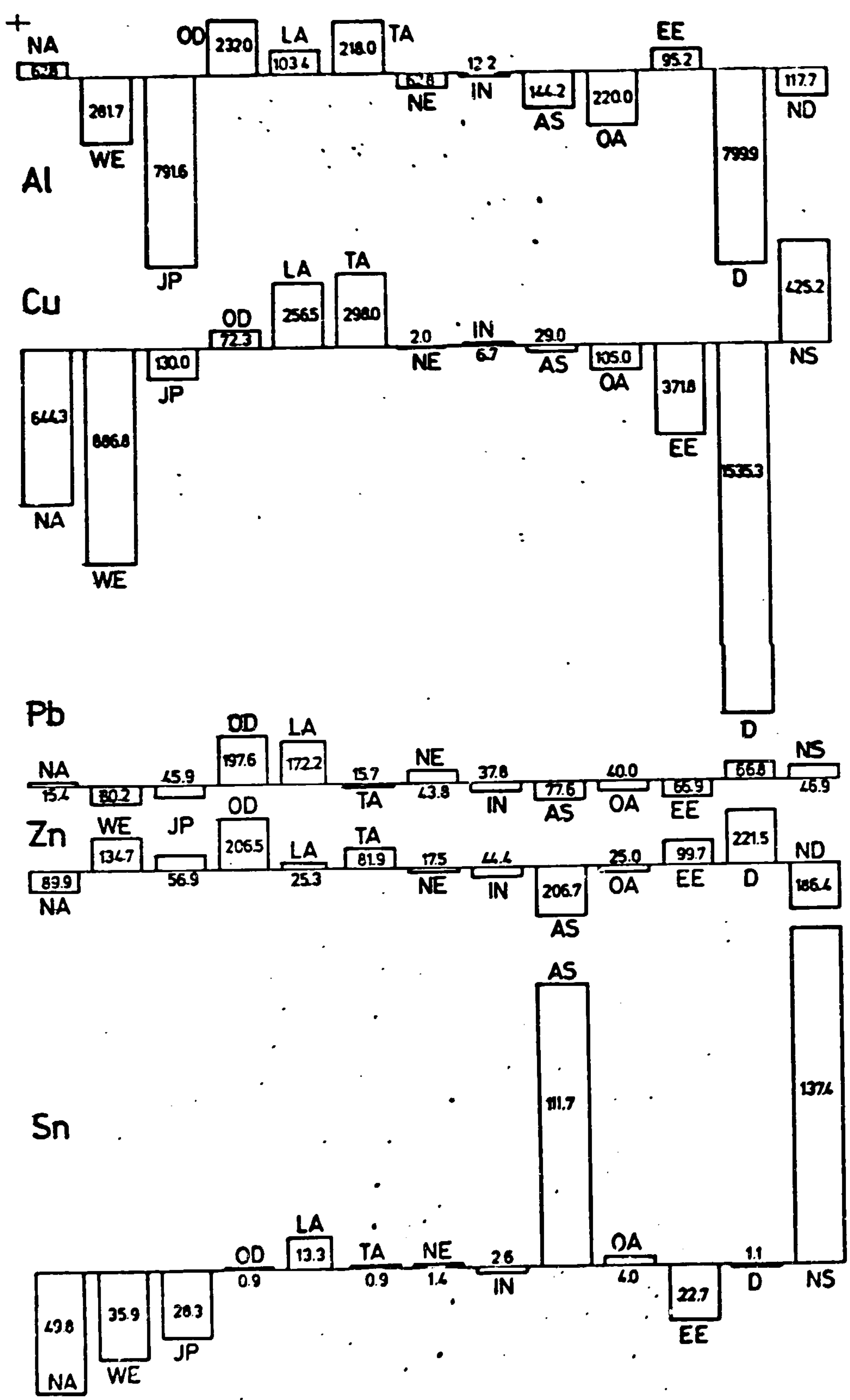
Fig. 16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OA 105.0
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D 1535.3
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TA 81.9
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D 221.5
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WE 35.9
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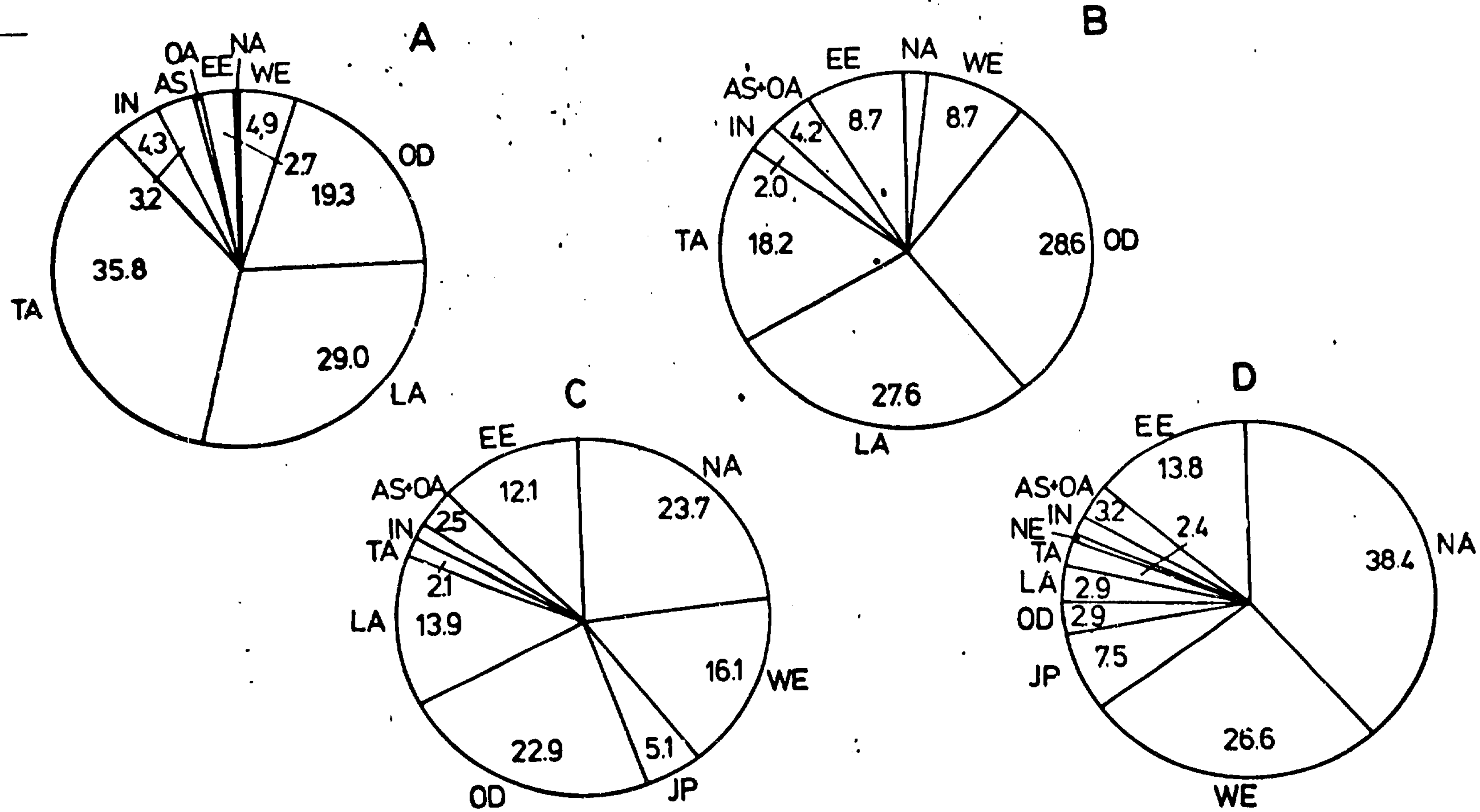
NS 137.4

Fig. 17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B
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18.2
28.6
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LA
C
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12.1
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LA
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5.1
OD
JP
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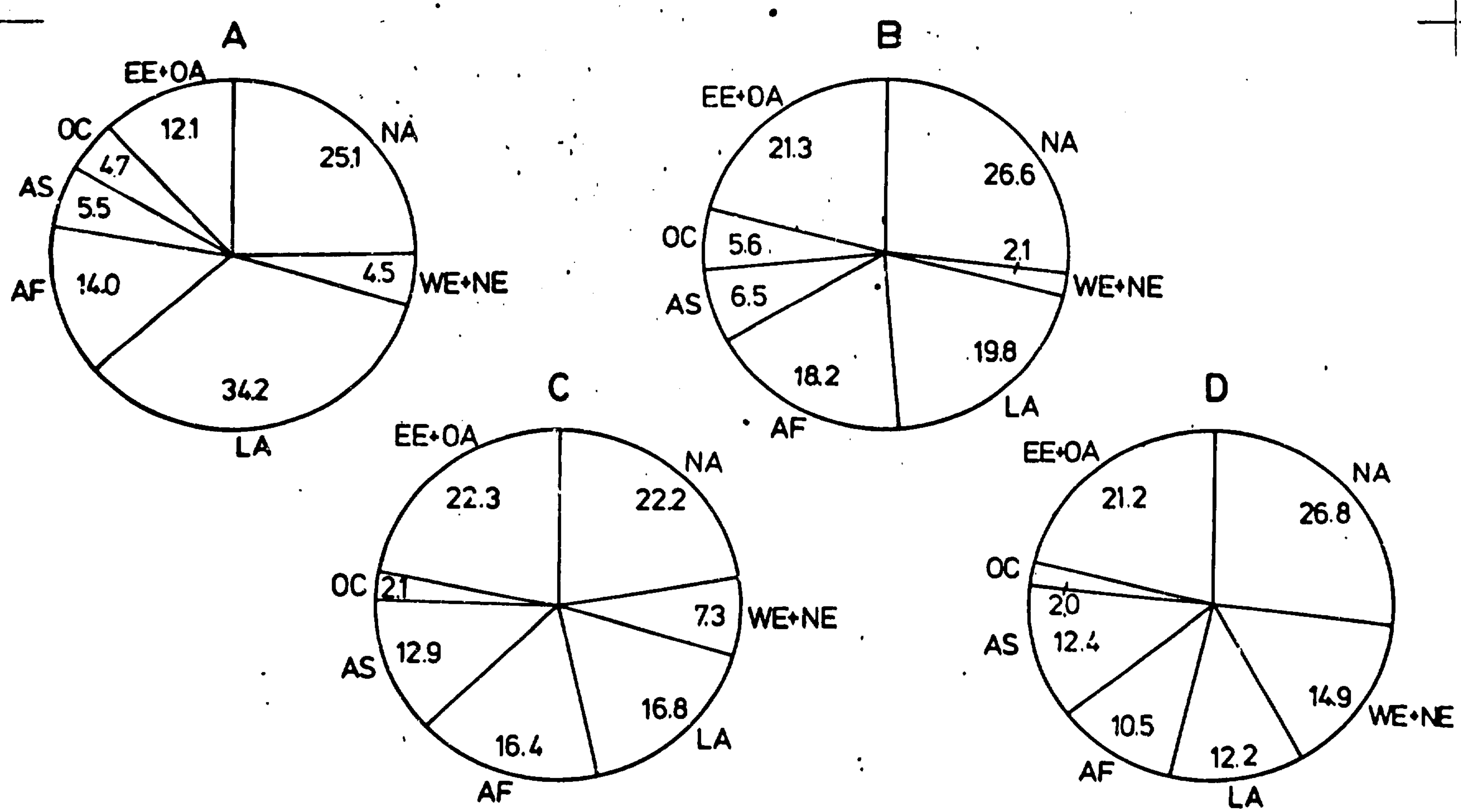
Fig. 18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21.3
NA
26.6
OC
5.6
2.1
WE+NE
AS
6.5
19.8
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LA
AF
C
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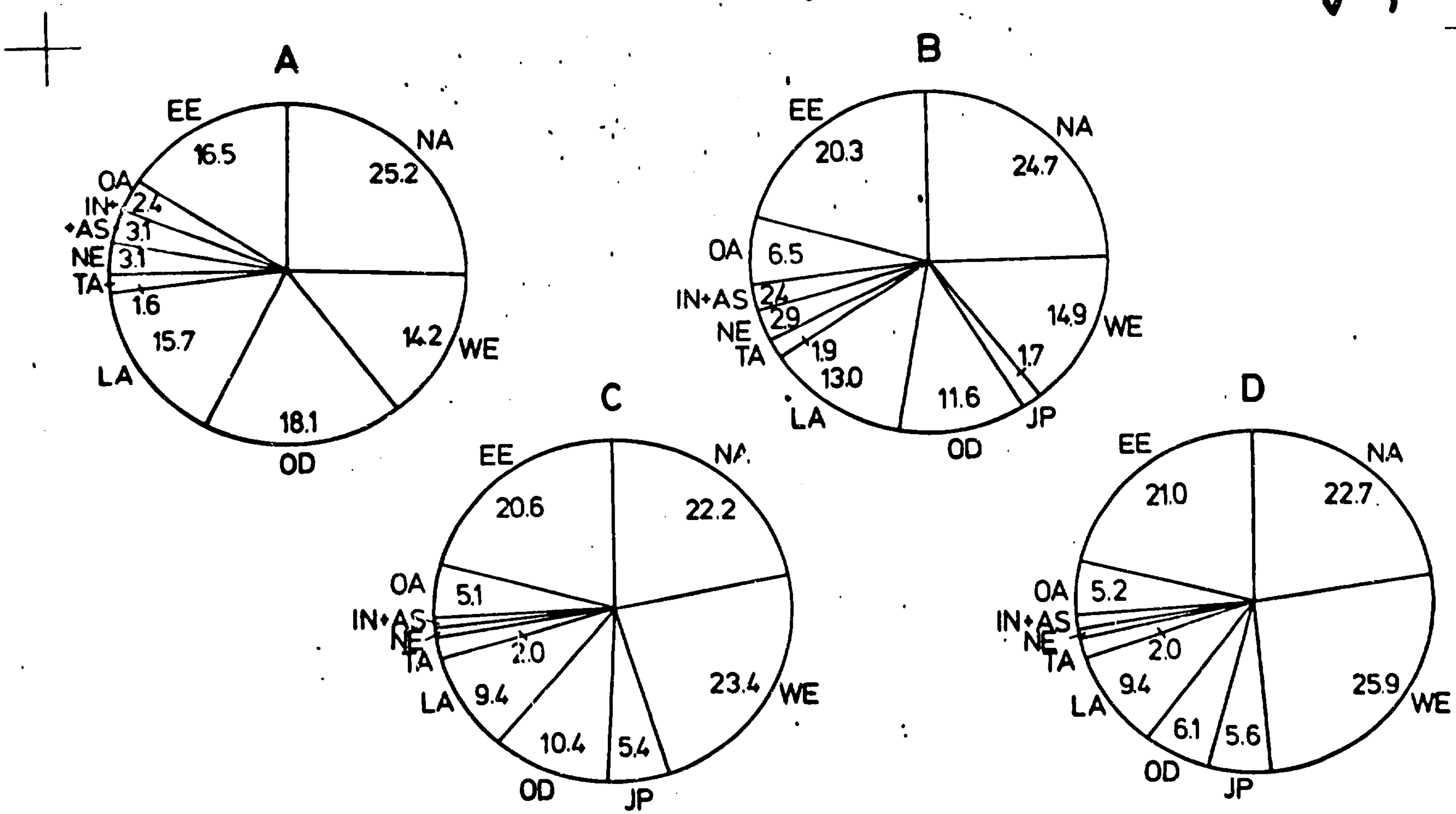
Fig. 8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2.4
2.9
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TA
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WE
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TA
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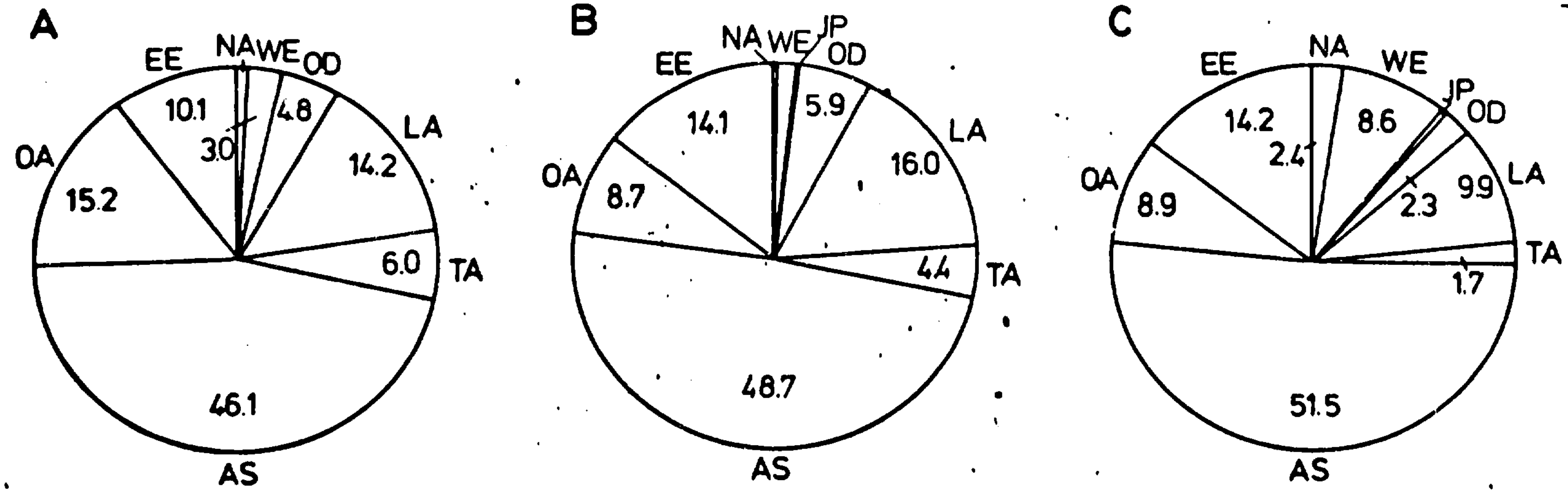
9.4
10.4
5.4
23.4
WE
OD
JP
D
EE
21.0
NA
22.7
OA
5.2
IN+AS
NE
TA
2.0
LA
9.4
6.1
5.6
25.9
WE
OD
JP

Fig. 21



A
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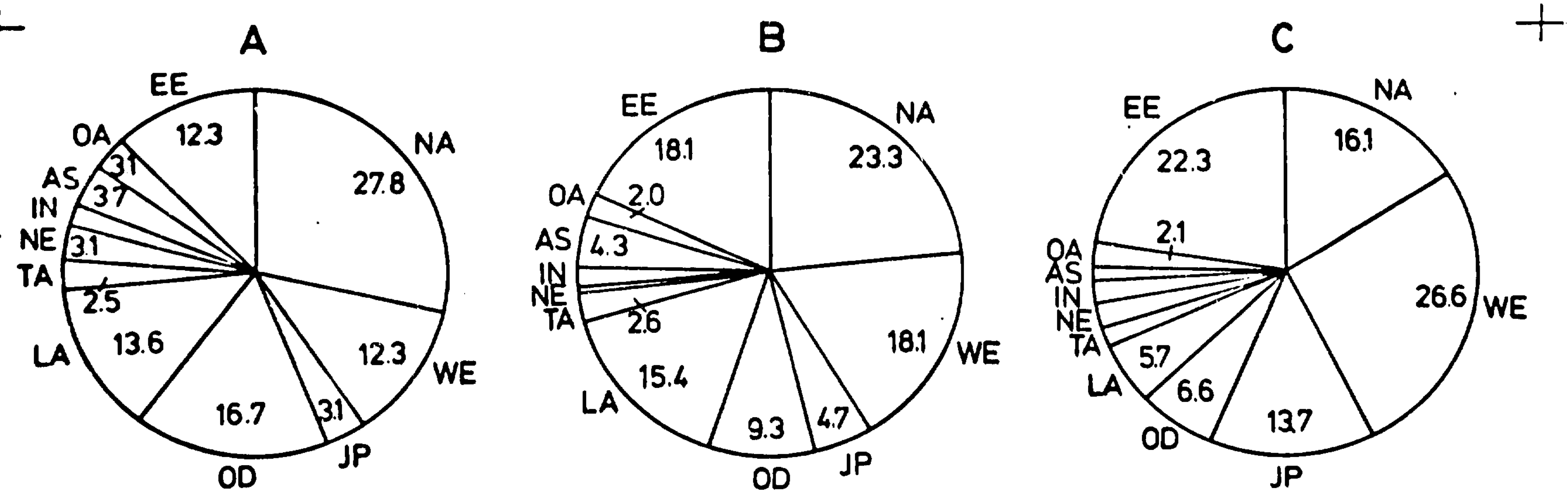
WE
OD
10.1
3.0
4.8
LA
OA
14.2
15.2
6.0
TA
46.1
AS
B
NA
WE
JP
OD
EE
14.1
5.9
LA
OA
16.0
8.7
4.4
TA
48.7
AS
C
EE
NA
WE
JP
OD
14.2
8.6
2.4
OA
LA
8.9
2.3
9.9
TA
1.7
51.5
AS

Fig. 20



A
EE
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OA
3.1
NA
27.8
AS
3.7
IN
NE
3.1
TA
2.5
LA
13.6
12.3
WE
16.7
3.1
JP
OD
B
EE
NA
18.1
23.3
OA
2.0
AS
4.3
IN
NE
TA
2.6
18.1
WE
LA
15.4
9.3
4.7
OD
JP
C
EE
NA
22.3
16.1
2.1
OA
AS
IN
NE
TA
26.6
WE
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6.6
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OD
JP